JULY

# THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

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The Journal of the American Dental Association. Vol. XXII, No. 7. Published by the American Dental Association, 212 East Superior Street, Chicago, Ill. Yearly subscription $5.00. Entered as second-class matter, May 1, 1928, at the postoffice at Chicago, Ill., under the act of Aug. 24, 1912. Published monthly.


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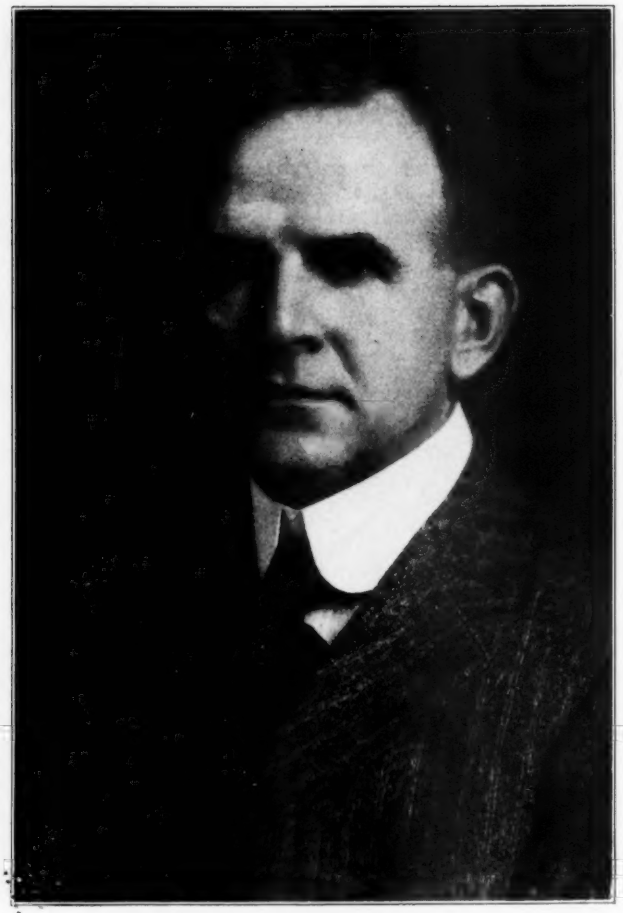

CHALMERS J. LYONS, D.D.S., D.D.Sc.
1874-1935

THE JOURNAL
*of the* AMERICAN DENTAL ASSOCIATION

Vol. 22 JULY, 1935 No. 7

## *Original Communications*

# THE TRANSITION IN THE ART AND SCIENCE OF DENTISTRY*

By FRANK M. CASTO, Ph.G., M.D., D.D.S., Cleveland, Ohio

THE important part taken in the history and advancement of the dental profession by the early dentists in New York makes it fitting that the dentists here should have the most active part in this celebration, the commemoration of one hundred years of organized dentistry.

It has been their obligation to safeguard the traditions, observe the tenets and uphold the principles and codes of practice left as a rich heritage to the profession by the strong, courageous and self-sacrificing pioneers and forthright leaders of the past.

We can all agree that the present high standards of dental education, the laws for the public control of dental practice and the high quality of dental service now established can be preserved only by those who have a true consciousness of their responsibilities and a broad concept of their obligations.

In the history of civilization, a century is but a brief span. In the history of medicine, five score years is a larger but still a very small fraction. In the history of American dentistry, that period includes by far the greater and more important part of its development. The foundation of American dental practice was laid centuries ago, but the foundation of the autonomous American dental profession was laid in this city 100 years ago today. We here fittingly commemorate the centennial of the profession of dentistry—a century of progress.

It has been said that the tripod upon which every profession must be built, if it is to become firmly established, must be: (1) the school, for the instruction of the future graduate; (2) the scientific society, for fraternal intercourse and the presentation of knowledge old and new, and (3) the journal, to disseminate knowledge and to stimulate a wider education and a more general improvement by reaching a wider public. In short, literature, education and organization

*Read before the New York Dental Centennial meeting, New York City, Dec. 3, 1934.

are the foundation of any lasting profession.

I shall attempt to summarize briefly the century of growth and development of these three essentials in connection with American dentistry.

Most writers on American dentistry start their history in the first decade of the nineteenth century. True it is that until 1840, in the United States, medicine and dentistry were essentially one, so that a review of dentistry must necessarily be but a view of the field of medicine; but, just as one could not hope to fully understand the early history of our country by starting with the year 1776, so one must go back of the nineteenth century if one is to understand the events which follow.

A man cannot become educated in a profession until there is a recorded history of that profession. There must be available a carefully digested mass of ideas, experiences and conclusions of the past, for it is on the past that the present is founded. Education is what raises a craft to the dignity of a profession. A craftsman needs only to be trained. A professional man must not only be trained, he must also be educated. This education can best be acquired by the literature of the profession.

From the time of Hippocrates, 400 years before the Christian era, until the fifteenth century, all information on dental disease and practice was a part, and a very small part, of medical literature. With the invention of printing and the revival of learning, literature increased. The writings of early physicians touching on dental subjects in their medical books and treatises laid the foundation for the literature which was to follow and stimulated the production of books and treatises devoted exclusively to dentistry. In 1728, Pierre Fauchard, in his book the "Surgeon-Dentist," assembled the best of all that was known in dentistry up to that time. Shortly after the middle of the eighteenth century, there began to appear in France small volumes written by surgeon-dentists and designed for the laity. The contents included simple descriptions, discussions concerning teeth and something on artificial teeth, and gave accounts of the author's successful treatment of patients. This adroit means of advertising soon spread to other countries, and during the next fifty years, in these books are found some valuable things written by French, Spanish, Italian, German, Dutch and English authors. Medical texts too began to give more attention to dentistry, and Bell's "System of Surgery," published in England in 1787, with 100 pages devoted to dental surgery, became popular in America.

In the American colonies in the seventeenth and eighteenth centuries, the only books were medical books, which were rare and mostly in Latin. The majority of the few surgeon-dentists were not familiar enough with Latin or any of the foreign languages, except perhaps French, to use any of the books which had been written, even had they been available. While French works had considerable direct influence on the American surgeon-dentist, the main influence came from Great Britain. Five British authors, Berdmore, Hunter, Blake, Fox and Murphy, were the founders of British dentistry, and their works were the major influence in American dentistry. Du Chamant's book, printed in French and English, dealing with new materials to be used in making artificial teeth, was also influential.

The reading of these books from Europe stimulated writing in America, and, in the early nineteenth century, there appeared several American books on dentistry by Skinner, Longbottom, James,

Parmely and Flagg. Woofendale, an Englishman, who practiced in New York from 1766 to 1768, wrote perhaps the first article in American dental literature when he described his American experiences; but it is from the above-mentioned American writers, the majority of whom wrote in little books copied after the French fashion, that we get the principal insight into the scope and methods of American dentistry in the early part of the nineteenth century.

The culmination of dental learning of that time was Samuel S. Fitch's book published in New York in 1829. In its 568 pages was a scholarly assembling of the information in the works of all the important writers up to that date. The bibliography showed 233 authors, who wrote in six different languages. The book, surpassing anything that had ever appeared in the English language, made available to every American surgeon-dentist a digest of all that had been written on dentistry. It gave a soul to this branch of surgery, which had previously been lacking, and gave to American dentistry a concreteness that it had never had. Chapin Harris' book, ten years later, based on Fitch, became the standard English work on dentistry for the next thirty years. Soon followed Harris' dictionary of dentistry and many smaller and important works on special phases of dentistry, such as Robert Arthur's "Gold Foil." These established the preeminence of American dental literature.

In 1839, in New York City, there was organized a publication committee of three practicing dentists, who undertook two projects. The first was the publication of a monthly journal called *The American Journal of Dental Science.* The first issue, published June 1, 1839, was the first dental periodical in the world. The announced purpose of the *Journal* was "the dissemination of useful and practical knowledge among dentists." The second project was the publication, as supplements to the journal, of reprints of English dental classics and translations of important French works on dentistry. The idea of reprinting was probably due to a general desire on the part of the profession to know more thoroughly the works to which Fitch referred in his scholarly textbook. At any rate, making this information available immediately broadened the opportunities of all American dental-surgeons and stimulated the betterment of dental practice.

Stockton's *Dental Intelligencer,* the first of the proprietary journals, appeared in 1843. Then appeared such periodicals as the *Dental Register of the West,* the journal of one of the first and most important sectional societies; the *Dental News Letter,* the forerunner of *Dental Cosmos,* and the *Missouri Dental Journal,* one of the first journals to be sponsored by a dental school, which recognized in it a value as an educational medium. Many others there were of varied merit, which were started or eventually bought by dental supply houses as a means of advertising. The proprietary journal has for a century been an important influence in dentistry.

The National Dental Association early recognized the necessity of a publication to hold the interest of its rapidly growing membership and the *Official Bulletin of the National Dental Association,* a quarterly, which later was published monthly, became, in 1922, the JOURNAL OF THE AMERICAN DENTAL ASSOCIATION. Supported by the 35,000 members of the American Dental Association, it is the mouthpiece of organized dentistry and the most important and influential dental publication in the world.

The above-mentioned literature, the publications and scores of other works have all had a part in molding dental

thought, increasing and disseminating dental knowledge and influencing research and advancement of methods and technic, all of which has in turn served to elevate dentistry to the status of a profession.

The history of the development of dental knowledge recalls the names, among others, of Hippocrates, Celsus, Aetius, Albacasis and Galen, but in general the history of the earliest dentists is a history of the earliest physicians. The history of early medicine is not within the scope of our discussion, but because medicine and dentistry were essentially one in the United States until about 1840, and because the history of dentistry cannot well be separated from that of medicine, our consideration must be primarily a view of the field of medicine.

Most of the physicians who came with the British colonists were clergymen who had studied medicine at Oxford or Cambridge as part of their preparation for service in the church. Because of lack of hereditary wealth, few men were able to go to Europe to study medicine, and few immigrant physicians arrived to replace those trained men who were dying. As long as clergymen-physicians lived, there were good men to accept apprentices; but as one generation of masters and apprentices followed another, the quality of training so deteriorated that, by the time of the French and Indian War, the settlers preferred the Indian medicine man with his incantations and occasional herbals to the white physician. To remedy the decadent condition of medical practice, there was founded, in 1765, with two professorships, the medical department of the College of Philadelphia, which was later to become the University of Pennsylvania. Between 1765 and 1800, eight more arts colleges founded medical departments, and most of the students received their A.B. degree before entering the medical school. The instruction was on the art of medicine, there being no science. There was required two to three year service under a preceptor to provide clinical instruction. After this came two four-month terms of lectures, whereupon the degree of bachelor of physics or bachelor of medicine was awarded. The degree of doctor of medicine, a higher degree, was seldom awarded.

High entrance requirements meant few students in the medical departments and fewer graduates. In 1800, only 20 per cent of the 5,000 physicians in the country had attended medical school and half of these never graduated. The remaining 80 per cent were older men whose entire training had been secured as apprentices to physicians who themselves had never attended medical school. Knowledge of these facts is necessary if one is to understand the subsequent decadence of American medical educational standards, which had a profound influence on medicine and also dentistry throughout the remainder of the nineteenth century.

Early in the nineteenth century, there arose a new type of medical education, the independent medical school. The school was without precedent, a new thing in a new country. It owes its origin to state medical societies, which had been organized by the better practitioners to distinguish themselves from those less competent. The societies were very critical about admission. An applicant had to pass a rigorous examination, after which he received a certificate which gave him the right to practice in the state and was considered a mark of distinction.

There soon arose a definite revolt against the high entrance requirements of the societies, led by the 80 per cent of apprentice-trained men, who saw no value in the high educational standards.

Charters granted to the societies by some state legislatures included the right to confer the rare, much-sought degree of doctor of medicine, although medical schools were granting only the bachelor's degree. Men found that the road to the doctor's degree through the societies was not barred by high preliminary educational requirements, and soon the degree of doctor of medicine was cheapened.

In 1807, the faculty of the medical school of Columbia University revolted against the high standards and resigned to become the faculty of the first of the new independent medical schools. This new organization, called the New York College of Physicians and Surgeons, copied the idea of the state medical societies and secured a charter authorizing it to grant the degree of doctor of medicine. The number of independent schools increased rapidly. Easier entrance requirements and the degree of doctor of medicine made the independent schools more popular than the universities, and many of the latter, like Columbia, were forced to abandon medical instruction. Finally, again in response to the opinion of the influential 80 per cent, the independent schools abandoned all requirements of preliminary education. The universities succumbed to the competition and granted the degree of doctor of medicine.

The course in the independent school generally consisted of two sixteen-week terms of lectures in two different calendar years. All the subjects were taken the first term, and the second term was but a repetition of the lectures of the first. The student was required to serve under a preceptor for at least two years, during which service he received all the clinical instruction that was to be his. The student's knowledge necessarily depended on the ability of the preceptor and many of the latter had never attended medical school. In addition, as the preceptors were often in some remote town, there could be no correlation between the lectures and the clinical experience.

In both lectures and clinical instruction, the emphasis was on the art of medicine. The student was taught how things were done, not why they were done. The aim was utilitarian, not scientific. "Practice" was no figure of speech as to what the student did when he left school. Not more than half ever returned for the second term. Those who had a medical degree were still outnumbered three to one.

During this period, there were happenings within and without the medical profession which one must understand in order to comprehend the gradual separation of American dentistry from medicine.

The period beginning in 1830 and ending with the panic of 1837 was a period of speculation, mutation and popular unrest. There were acute disturbances within the profession itself which, together with the general unrest, were to have a pertinent relation to autonomous dentistry.

Elisha Perkins' patented treatment of ills by galvanic current generated by "metallic tractors" had been the vogue in the early years of the century. After the novelty wore off, another cult arose, which taught that all medicines not of plant origin were poisonous. The members of this cult adopted the name of Botanico or Thomsonians, and received patents on their medicines. Requiring no training, experience or education, but only a sum of money for a book of instruction and a supply of medicine, the cult became popular, grew and prospered. To the annoyance caused by these and other cults was added the problem of medical sects.

Homeopathy was based on the theory

of drug potentiality and was a protest against nauseous doses in vogue with the regular school of medicine. Although there were no institutions in which homeopathy was taught, it made rapid progress because the public mind was in a restless mood toward medicine owing to its recent attacks on the cults.

The Botanic-Electics, another powerful sect, was a protest against polypharmacy. They taught the doctrines of specifics—the use of a single drug for each disease.

The medical profession refused to recognize any of these doctrines, but these groups became powerful enough to form state societies. Membership in a medical society gave prestige second only to a medical degree, and the societies of the numerous cults and sects, having gained the same privileges under the law as the regular medical societies, came to control medical education and also the legal qualifications for practice.

The regular school of conservative medicine thus attacked on both flanks by cults and sects was now attacked from the rear, when members of the profession began to desert to sectarian medicine, convincing the laity of the frailty of the profession of which they had so recently been a part.

It was in such schools and under such professional, economic and educational conditions that the men who were to lead in dentistry grew up.

At this time, dentistry could be considered neither an art nor a profession. It was practiced by a number of unassociated widely scattered persons who were either men with some education and training, who were called respectable dentists, or else were charlatans or quacks. The physicians at that time took pride in their versatility in both teaching and practice, and specialization was decried by the profession and the laity. The surgeon-dentist practicing a specialty was not regarded with favor and was more or less ignored.

For some years, the medical schools had refused to accept service under a surgeon-dentist as fulfilling the apprentice requirements for a medical degree. Thus, a medical graduate seeking to enter the dental profession was compelled to do more work than his classmates entering medical practice, and there was no degree available to show the additional training. It seems probable that these conditions did not tend to promote a particularly amicable feeling between the professions.

Several years later, the dentists proposed that special training be given in the medical school of the University of Maryland for those who aspired to practice dentistry. The proposal was refused for reasons which had little relation to either dentistry or dentists. As has been suggested, the tradition of the medical profession was versatility; hence, the proposal was rejected because dentistry was a specialty and not because dentistry was dentistry. Assent, moreover, would have violated conservatism and annulled precedents in refusing to admit to the curriculum therapeutic specialties such as the homeopathic and botanic. Finally, the men who were to teach the dental subjects were personally not liked by the governing body of the university, and the rejection, therefore, was a rejection of personalities rather than of dentistry itself as being unworthy. The reasons for the refusal were not clear to the dentists at the time and an ill will was created between the two professions, to which is traceable much of the present-day antipathy between physicians and dentists.

The dentists solved the problems of specialized education, recognition of dental apprenticeships and distinguishing dental degrees by following the precedent

established by the physicians several years before. They decided to establish a dental school independent of any other educational institution. This was the fruition of the germ of a similar idea expressed by Eleazar Parmly in a printed paper which had appeared in 1818, almost twenty-five years previously.

In one respect, this decision came at an unfortunate time. Dentistry was still considered a part of medicine, and this move of overt separation by the dentists, at a time when the medical profession, weakened by desertions and internal strife, was fighting desperately against cults and sects, served to further widen the breach between the two professions.

Without precedent, the new school founded in Baltimore in 1840 was necessarily modeled after existent medical schools. There was no requirement of preliminary education, and in order to attract medical school graduates, the full course was fixed at a single term of sixteen weeks. There were no clinical facilities and the faculty, consisting of two physicians and two dentists, merely gave a series of didactic expository lectures, after which the student received the degree of doctor of dental surgery.

Five years later, in 1845, the Ohio College of Dental Surgery was established in Cincinnati. Patterned after the Baltimore school, but with some new features, it became the western influence in dental education.

The one-session course was soon abandoned for two sixteen-week terms. This made the dental course the same length as the course in most medical schools. Unlike medical training, there was no requirement that the student continue work under a preceptor. The paucity of competent dental surgeons to serve as preceptors forced the dental schools to put clinical instruction into the school curriculum. At this time, clinical instruction was not yet part of medical training. There was little work done under preceptors until 1867, when the Harvard Dental School inaugurated a requirement of sixteen months under a preceptor, in addition to the school course, before the degree was conferred. The current dental journals hailed this as a great advance in dental education.

The dental school instruction in medical subjects was not equal in either quantity or quality to similar instruction in the medical schools, for the reason that, in the medical schools, the teaching was done by practitioners, who, while they received little money, did acquire prestige and make contacts which were potential sources of case reference and consultation in the future. Neither of these rewards accrued from teaching in a dental school, and, therefore, it was more difficult to secure competent medical teaching in the dental school.

As those far-sighted students who took courses in both medical and dental schools gradually became fewer, the contact between dental and medical education became more and more attenuated. This divergence of the professions increased with the years. The innovation of correlating clinical instruction and didactic teaching and the fact that the clinical instruction became a source of income to the private owners of the dental schools had an important effect in that some of the schools were turned into institutions for profit, with a serious lowering of educational standards.

Another unfortunate occurrence was the application of the term "mechanical dentistry" to that part of dentistry connected with making dentures, as distinguished from the phase of operating on the living teeth of the mouth. Thus, the opponents of dentistry called mechanical dentists mechanics and classed them with the various types of craftsmen,

especially after they began to patent their inventions. The medical profession considered patented instruments and appliances of the same ilk as patent medicines, and so this became still another factor in estranging the professions.

As the field of mechanical dentistry was novel and profitable, this phase of education was soon emphasized to the almost total exclusion of everything else. Fundamentals of medical science were forgotten or ignored. The emphasis was on the art of dentistry and digital dexterity. The science of dentistry and mental celerity became secondary. These events, together with the effects of the system of secret discounts, bonuses and prejudicial periodical literature sponsored by dental supply manufacturers, all served to foster in the student an attitude of utilitarianism and commercialism rather than altruism.

Dentistry rapidly developed the self-satisfied and independent characteristics of adolescence, and mutual scorn between the parent medicine and the offspring dentistry continued to develop. As a result of this smug attitude, American dentists ceased to go abroad to study and missed important scientific developments and discoveries being made in Europe.

The enunciation of the cell theory by Schleiden and Schwann, Virchow's doctrine of cellular pathology, the founding of the science of bacteriology by Pasteur and the development of experimental physiology in England had a revolutionary influence on American medical education which was lost to dentistry.

The influence of those medical men who had studied in Europe led to the establishment in the medical schools of laboratory teaching in physiology, bacteriology and pathology as a basis for clinical medicine. This was followed by an expansion of the course in medical schools, both as to length and number of sessions and the replacement of the repetitive course by the graded course. About this time, there was a realization that the independent proprietary type of medical school could no longer fulfil the needs of the profession, so that soon there began a retransfer of medical education to the universities and an advance in the requirements of preliminary education.

Following the lead of medicine, the dental school increased the number and length of its sessions, but it occupied the added time, not with basic and medical science, but with extended technic courses.

The Association of Dental Colleges, organized to improve dental education, was wrecked within two years on the rock of honorary degrees, but eventually dentistry, again following the trail blazed by medicine, once more became affiliated with educational institutions when, in 1867, there was established at Harvard a dental school which was the model for dental schools for the next thirty years. So popular did the university affiliated schools become that soon all the independent dental schools were endeavoring to effect some connection with universities or medical schools. As a result of the new policy, there were, by 1900, only a few dental schools nominally isolated from all other types of education.

In raising preliminary entrance requirements, and in the field of the biologic sciences, dentistry was somewhat slow in following the precedent of medicine, but there has been a steady improvement in these respects so that now the maximum entrance requirement, with one exception, is two years' preprofessional work in a recognized college and, in the four years of thirty-two weeks per year, the dental student receives a quality of instruction which compares most favorably with that received by the university medical student.

What will be the future of dental education no one can foretell, but the more essential factors upon which that future will depend are: the extent of university support, financial resources, stability and efficiency of dental faculties, improved pedagogic methods, cooperation between medical and dental schools and professions, adequate research facilities, support and encouragement by the dental profession and a sound and constructive administrative policy.

The beginning of professional organization is lost in antiquity. For our purposes, we may say that professional organization began about 1,000 years ago with the guilds of Europe—those associations of persons with similar tastes, purposes and vocations.

In the tenth century appeared religious guilds of clergy and laymen. Within the next hundred years, craft guilds had begun to develop, and 600 years later, one finds, in addition to countless craft guilds, many merchant and social guilds. In certain of the guilds, qualification for membership was determined solely by the quality and salability of the product. In other guilds, such as those of apothecaries, barbers, lawyers, physicians and surgeons, all of whom render a service, the capability of a candidate was determined by the recommendations that he produced and the answers that he gave while being examined. The critical supervision of entry to the service guilds soon proved its worth and to certain of the more important and influential guilds were given charters granting them certain privileges. The government recognition of a guild gave the member of that guild the status of a legal practitioner in his particular line. In this method of recognition, we see the beginning of licensing by government after examination. The first of the government examining boards for the professions was that established in London in 1511 to examine physicians. Men who had passed the examinations given to a particular vocational guild formed groups, which were called colleges. These colleges later chartered (the Physicians, in 1518, the Surgeons, in 1540, and the Apothecaries, in 1606) were given the duty of setting the standards of the particular profession, and one who was successful in passing the examination was designated as a licentiate and thereby became a legal practitioner.

The English practice of chartering societies and having them determine the standards of the profession was continued in America. In 1770, the first state medical society in America was founded in Connecticut and, by 1800, nearly every state in the union had its medical society, which granted certificates or diplomas to those who passed the examinations and were able to meet certain other qualifications.

The first specialization in medical practice that attracted any considerable number of men was the restriction of practice to what is now called dentistry. The surgeon-dentists were the first group of medical specialists in America. They were still considered a part of medicine. In the medical societies, the discussions and papers were mainly concerned with general medical practice and, although some of the surgeon-dentists were members of medical societies, the versatile interests of the physicians and the restricted interest of the surgeon-dentist had few points in common.

The surgeon-dentists suffered from isolation. Because of their restricted interest, they were isolated from the physicians and, at the same time, because they were few in number, there was little contact among themselves. Also, the surgeon-dentists were confused in the public mind with the mechanical dentists, those artisans, unschooled in medicine, who made

and fitted dentures, but did no operative dentistry. Confusion and failure to differentiate was perhaps natural, for extracting teeth, the most familiar phase of dentistry, was done by physicians and craftsmen as well as surgeon-dentists.

It has already been pointed out that, in colonial days, physicians established medical societies, not only to provide a forum for professional discussion, but also by restriction of membership to differentiate in the public mind the better physicians from those less competent. These societies had been successful in bettering medical practice and to their members, the community, by common consent and by statute, accorded certain privileges and exacted certain responsibilities. It was logical, therefore, that the surgeon-dentists should turn to the same method to provide a means of discussing mutual problems, to remedy their isolated status and to distinguish themselves from mechanical dentists.

As early as 1817, Dr. Hayden had broached the idea of a national convention of dentists. From time to time, he renewed his attempts, only to fail. Dr. Fitch's great book, in 1829, stimulated the movement for organization, just as it made a demand for a dental journal and finally led to institutional dental education. Finally, in New York City, Dec. 3, 1834, the Society of Surgeon-Dentists of the City and State of New York was organized. On that day, exactly 100 years ago, the American dental profession was founded.

This first American society of dental-surgeons was modeled after the first medical societies of about sixty years before. The new society issued a certificate to successful candidates for admission which entitled them to practice within the State of New York.

Local societies of surgeon-dentists soon sprang up in several of the larger cities. These several societies had interests in common and, at a date not accurately determinable, there began a project to form an organization more nearly national in scope. After several attempts, the American Society of Dental Surgeons was organized in New York, in 1840. One of its primary, though unannounced purposes was to secure legal recognition of its members in other states. The constitution adopted showed the object of the society to be:

> To promote union and harmony among all respectable and well-informed Dental Surgeons; to advance the science by free communication and interchange of sentiments, either written or verbal, between members of the Society both in this and other countries; in fine, to give character and respectability to the profession, by establishing a line of distinction between the truly meritorious and skillful, and such as riot in the ill-gotten fruit of unblushing impudence and empiricism.

While national in name, the American Society of Dental Surgeons was actually regional, most of its members being from the northern and central Atlantic Coast states. Ohio the fourth largest state at that time, was represented by only three members. The name adopted, the American Society of Dental Surgeons, was significant, since it indicates that the members of the society, most if not all of whom had had medical training, originally had not meant this to be a separation of dentistry from medicine. The replacement of the then common title surgeon-dentist by the appellation dental surgeon, a term used in England and abandoned two centuries earlier, is further indication that there was no intent to withdraw from medicine. The term surgeon-dentist emphasizes the dental phase, but the term dental surgeon, by using the adjective prefix, minimizes the dental side and indicates a special type of surgeon. This seems to imply that these men desired to

be considered as still in the medical profession, but as specialists in that profession. The term had the same implication as orthopedic surgeon has today.

The unrest in the medical profession, due to internal and external attacks as well as the general depression of the time, had engendered a critical attitude. Medicine, without a national society, looked at this dental organization as perhaps marking the beginning of the disruption of the medical profession, which already had several cultist and sectarian organizations, allied to medicine but apart from it. Many physicians called this action desertion and some even classed the dental surgeons with the cults and sects. Because of this unreasonable and unwarranted attitude of the medical profession, dental historians generally regard the date of the organization of the first dental society as marking the parting of the paths of medicine and dentistry.

The American Society of Dental Surgeons never became truly national because the restrictions imposed by the inadequate means of transportation limited representation, and hence influence, to the eastern states. The western states had their own regional organizations and some, like the Mississippi Valley Society of Dental Surgeons, organized in Cincinnati in 1844, had a great influence upon dentistry in the west.

In an attempt to obviate the difficulty which prevented any of the societies from becoming national in character, Elisha Townsend organized the first American Dental Convention, in 1855. These national dental conventions, like their medical counterparts, proved unsatisfactory because of lack of continuity. There being no continuing officers, the conventions were a series of annual assemblies rather than meetings of an organization at intervals of a year. There was no uniformity of policy or method, and no such affiliation as one would expect in an organization of persons of the same profession with ostensibly the same aims, ideals and purposes.

Thus, for twenty-five years, from 1834 to 1859, there was but a semblance of national dental organization. In the latter year, we have what was to prove the beginning of a consecutive, definite national organization, when those not satisfied with the operation of the convention plan formed the American Dental Association; so that, while we celebrate a century of dental organization in the United States, we also celebrate three-quarters of a century of continuous national organization.

The new national organization was split after the Civil War, when, in 1869, the dentists of the South formed an independent organization, named the Southern Dental Association. In 1897, the northern and southern associations were consolidated and the name National Dental Association was adopted. The first meeting of these combined societies was held at Old Point Comfort, Va. The membership of this society was comparatively small, but included most of the outstanding men of the dental profession. This state of affairs continued until a reorganization in 1913, when a plan was adopted whereby membership in local and state societies carried with it membership in the national organization. This new arrangement was the prime factor in increasing the heretofore nominal membership to one of many thousands. In 1922, at the annual meeting in Los Angeles, the name "American Dental Association" was again adopted, in order to more easily distinguish the dental organization in the United States from national organizations in other countries.

Since the reorganization in 1913, the American Dental Association has continuously expanded its activities, until they

now include a large number which extend into every field of the art and science of dentistry and may be grouped into a dozen or more categories.

The national organization has cooperated in educational progress, in unification of licensing procedures, in improvement of the literature, in encouragement of research, in classification of laws and in all those tendencies and forces that converge to develop a unified profession that can best serve public welfare.

Of the three essentials of a profession, literature, education and organization, one cannot say which is the most important, but one can safely say that organization is the consolidating influence which serves to bind the other two to itself, to give a unity, which is a condition precedent to progress. Moreover, the development and coordination of these three essentials not only culminated in the transition or evolution in the art and science of dentistry, but also established dentistry as one of the learned professions.

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# THE RÔLE OF THE PUSH-BACK OPERATION IN CLEFT PALATE SURGERY*

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THE primary purpose of any cleft palate operation is to repair the split palate and to correct the speech defect. The latter can be accomplished only by placing the "palatopharyngeal-sphincter" in or close to its normal position. From the patient's standpoint, any operation on the palate is judged by the improvement or lack of improvement in his speech. The secret of obtaining good speech in cleft palate patients is to establish complete velopharyngeal closure. This can be obtained only by an operation which will permit the velum to come in contact with the pharyngeal wall and allow the "palatopharyngeal sphincter" to shut off the nasopharynx.

The palate in man can vary considerably in length without interfering with normal speech; yet there are limits above or below which normal speech becomes impossible. A study of the speech after successful cleft palate operations reveals the fact that its deviation from normal is almost directly proportionate to the shortness of the palate. The greater the efficiency of this closure, the more satisfactory the speech. In other words, insufficiency of velopharyngeal closure is due to an abnormality in the distance between the velum and the pharyngeal wall when the palatopharyngeal sphincter is contracted.

In a short palate (Fig. 1), the palatal insertion of the superior constrictor and levator palati muscles is located farther forward than in the normal palate. A considerable number of cleft palate patients have a short palate.

Individuals with cleft velum alone, and patients with a cleft which extends as far forward as the junction of the mid-

*Read before the Section on Oral Surgery, Exodontia and Anesthesia at the Seventy-Sixth Annual Session of the American Dental Association, St. Paul, Minn., Aug. 8, 1934.

dle third with the anterior third of the hard palate have shorter palates than those with lip-jaw palate splits. A study of our own postoperative follow-up and of cases referred to us after operation by competent surgeons has convinced us that where no shortening of the velum exists, good operative and functional results may be obtained when successful closure of the cleft palate has been accomplished.

The purpose of this paper hinges on the last paragraph. We have been misunderstood as saying that all cleft palate cases should have the "push-back" operation. Just why this impression has gained credence, we cannot understand. We have never made such a claim because we do not believe this to be the fact.

We do not use the "push-back" operation in cases in which we can obtain velopharyngeal closure by the methods generally employed, such as the von Langenbeck operation or any of its modifications. We do believe that the "push-back" operation has a distinct place in cleft palate surgery, and we will show the cases in which it is indicated. Since success in cleft palate surgery is largely dependent on velopharyngeal closure, we will review the salient points on this subject.

Velopharyngeal closure is accomplished by the palatopharyngeal sphincter situated in the lower part of the nasopharynx. When it contracts, it shuts off the nasopharynx from the oropharynx. The palatopharyngeal sphincter is a definite sphincter muscle which produces circular contraction of the nasopharynx. (Fig. 2.) This sphincter is a muscular ring formed by the pterygopharyngeal portion of the superior constrictor muscle, which is inserted in the palatal aponeurosis at the site of insertion of the levator palati muscles. The closure of this sphincter is complete during the formation of the nonnasal sound "ah," made with the mouth wide open.

The structures concerned in causing this closure are the lowest portion of the

Fig. 1.—Above: Left: Dissection of pharynx in congenitally short palate. Right: Division of one hamular process removing tension on tensor palati muscle. Below: Left: Division of both hamular processes removing all tension on tensor palati muscles and placing palatine insertion of superior constrictor in desired position to close nasopharynx. Right: Backward displacement of palate with division of hamular processes restoring palatopharyngeal sphincter in cases of congenital shortening of palate.

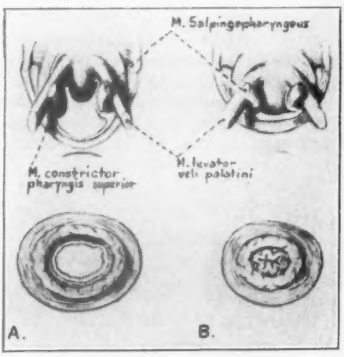


Fig. 2.—Palatopharyngeal sphincter. *A*, sphincter open. *B*, sphincter closed.

nasopharyngeal wall on one side and the velum on the other (Fig. 3). The portion of the nasopharyngeal wall which enters into this mechanism is formed by the pterygopharyngeal portion of the superior constrictor muscle, which, on contraction, constitutes what is usually referred to as Passavant's cushion. The velum from the standpoint of function is

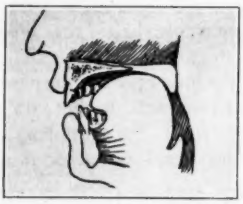

**Fig. 3.—Normal velopharyngeal closure. The forward movement of the posterior pharyngeal wall is manifest by the bulging of Passavant's cushion. The vertical portion of the velum is shown to assist in the sphincteric closure.**

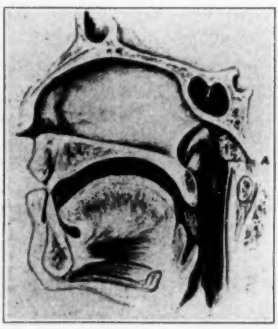

**Fig. 4.—Frozen sagittal section with levator palati muscle *(A)* dissected.**

divided into two parts, an anterior horizontal portion made up essentially of muscle tissue and a posterior vertical portion which hangs down from the former (Fig. 4). This latter segment is formed almost entirely by the uvula. At the junction of these two portions, there is an interlacing of the palatal muscles. It is at this site that the levator palati muscles are blended and attached to the palatal aponeurosis (Fig. 5). They raise the velum upward and backward. The nasal aspect of this portion of the velum which corresponds with the attachment of the levator palati muscles approximates Passavant's cushion during velopharyngeal closure and forms the anterior segment of this mechanism. At rest, the uvula hangs down as a curtain. As it contracts and ascends slightly on velopharyngeal closure, it makes the vertical and dependent portion of the velum

**Fig. 5.—Sagittal section of head showing lateral wall of pharynx. There are two points of insertion for the pterygopharyngeus portion of the superior constrictor muscle of the pharynx.**

shorter. This causes the velal segment to become broader and thicker at the site of insertion of the levators.

The elevation of the pharynx brings these muscles into proper position, enabling them to close the passage between the oral and nasal portions of the pharynx. To recapitulate: The elevator muscles of the pharynx pull the relaxed muscles upward and forward, while the

lateral walls approach the midline. The velum is brought upward and backward by contraction of the levator palati muscles. The pterygopharyngeal portion of the superior constrictor muscles, by contraction, causes the sphinteric closure of the nasopharynx (Fig. 6).

In cleft palate, the anterior segment of the muscle forming the pharyngeal ring is split and the separated ends are far apart (Fig. 7). The cleft velum assumes the shape of a horseshoe with the opening directed backward. The borders of the defect in this case take the shape of one side of the horseshoe with the convexity directed away from the median line. The tensor palati muscle is shorter in cleft palate than in normal cases. The independent pull exerted on each side by this shortened muscle drags each half of the cleft velum forward and outward and causes the tips of the cleft uvula to point toward the median line. Each half of the cleft palate is continuous with the corresponding arm of the cleft pharyngeal ring. The shortening of each half of the velum just mentioned tends to drag the corresponding arm of the pharyngeal ring forward and outward, thereby flattening it on each side and increasing the diameter of the nasopharynx in all directions. The cleft superior constrictor muscle of the pharynx is therefore unable to produce the necessary

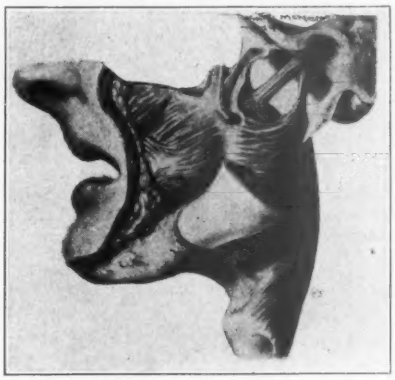

Fig. 6.—Section of pharynx, showing palatine and pterygoid insertion of pterygopharyngeus muscle. The lateral pterygoid plate and the tensor palati muscle have been removed.

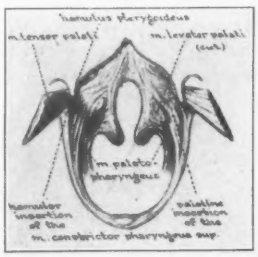


Fig. 7.—Section of cleft velum in child, about 2 years old, showing split pharyngeal ring. The palatine insertion of the superior constrictor muscle of the pharynx is to be noted. Each half of the split velum is shortened by the outward and forward pull of the tensor palati muscle.

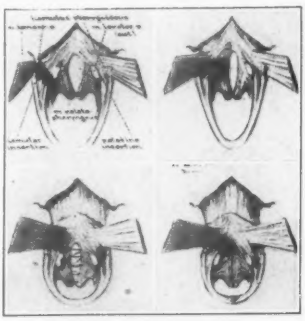

Fig. 8.—Above: Left: Division of hamulus on one side eliminating tension on tensor palati muscle. Right: Division of hamulus on both sides eliminating tension on tensor palati muscles. Below: Left: Backward displacement of palate with division of hamular processes, restoring palatopharyngeal sphincter in cases of split velum. Right: Restoration of palatopharyngeal sphincter when sutures are applied in "push-back" operation in cases of split velum.

sphincteric closure between the oropharynx and the nasopharynx (Fig. 8).

Division of the hamular process releases the tension produced by the action of the tensor palati muscle and permits mesial displacement of the point of palatal insertion of the superior constrictor muscle of the pharynx. This also displaces inward and backward that portion of the pterygopharyngeous muscle which is inserted in the hamulus; which thereby reduces the abnormally increased diameter of the nasopharynx. The function of the tensor palati muscle is also altered from that of a tensor to that of an elevator, thus augmenting the function of the levator palati muscle. By this means, lateral tension is eliminated and the anterior ends of the cleft pharyngeal ring can be approximated at the midline;

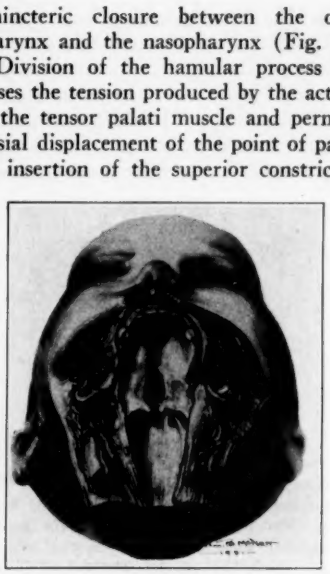

Fig. 9.—Cleft velum in child, aged about 2 years.

Fig. 10.—Relaxation incision applied in first stage of "push-back" operation.

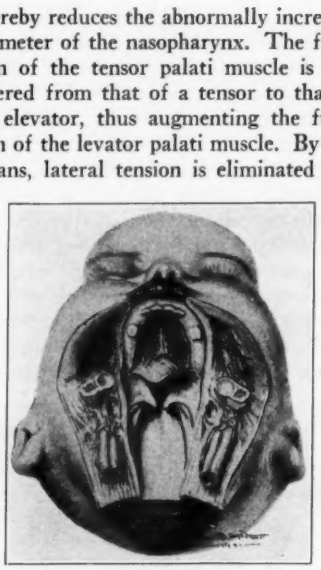

Fig. 11.—Palatine mucoperiosteum raised from underlying bone all the way back to attachment of palatine aponeurosis.

Fig. 12.—End of first stage in push-back operation performed for cleft velum. The raised palatine mucoperiosteum is held in position with silk sutures.

which restores the divided palatopharyngeal sphincter.

Restitution of the anterior continuity of the superior constrictor muscle of the pharynx cannot restore proper function in cleft palate patients when the palate is short. This explains why the so-called von Langenbeck operation fails to restore function in cases of short palate (Fig. 9).

Closure of the split palate by mesially displacing the soft tissue covering the palatal vault is the cornerstone of cleft palate surgery, because all conservative surgical methods for repairing the palate

Fig. 13.—Elevation of palatine mucoperiosteum when lateral incisions are applied.

are based on this principle. This procedure was codified by von Langenbeck, after whom the operation is named. The modifications and the improvements added from time to time to this method by Billroth, Ehrmann, Wolff, Berry, Addison, Veau and other cleft palate pioneers failed to take into account our present conception of the function of the palatopharyngeal sphincter and its rôle in cleft palate surgery when the palate is shortened.

In the majority of our cleft palate operations, including the "push-back" operation, we use the multistage procedure, in which two or more distinct operations are performed at separate sittings, an interval of time elapsing between the stages to permit the collateral circulation to become established. The vast majority of our cases are done in two stages. We allow an interval of approximately three months to elapse between the first and second stages of the "push-back" operation.

Experience has shown that a long interval of waiting between the first and

Fig. 14.—Second stage of push-back operation. The palatal mucoperiosteum has been completely freed from the underlying bone and the nasal mucosa divided from its connection with the posterior border of the hard palate. The hamular process is also divided above the point of connection with the mesial pterygoid palate.

the second stage is a wise procedure and rewards one with fewer partial or complete failures from sloughing. Not only is the collateral circulation better established, but the tissues become thicker as well, and will withstand much more trauma. In the first of these procedures, the relaxation incision is made, permit-

ting the raising of the palatal mucoperiosteum from the underlying bone from before backward (Figs. 10 and 11).

The posterior palatine vessels and nerves are divided as the palatal mucoperiosteum is freed from its bed as far back as the attachment of the palatal aponeurosis. The flap is then replaced in its original position and held with sutures (Fig. 12). Seven days later, the sutures are removed. The second stage is performed after three months.

At times, especially in patients in whom the palatal tissue is thin, a lateral incision is made on each side, leaving an

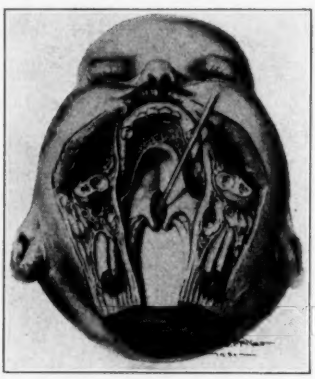

Fig. 15.—Displaced palate completely freed. The ends of the relaxation incision are extended over the pterygomandibular fold. The borders of the cleft velum are also freshened.

anterior bridge of connection behind the incisors. This bridge is divided in the second stage of the operation (Fig. 13).

Three months after the primary operation, the collateral circulation being well established, as determined by the color and thickness of the flap, the final procedure is instituted. The mucoperiosteum is again raised and the palatal aponeurosis and nasal mucous membrane are freed from their connection with the posterior border of the hard palate. The hamular process is divided on each side by means of a chisel applied above the point of its connection with the mesial pterygoid plate. It is always necessary to extend the relaxation incision backward around the maxillary tuberosity and over the pterygomandibular fold to obtain sufficient mesial displacement of the muscular tissue (Fig. 14).

When tension is freed, the two halves of the cleft palate meet easily in the midline. The velum will be in contact with the pharyngeal wall and, when the sutures are subsequently applied, the palatopharyngeal sphincter will be restored.

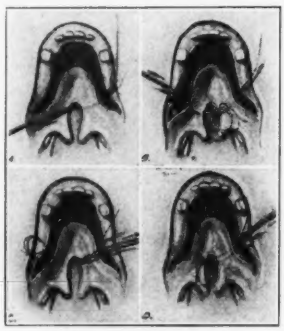

Fig. 16.—Placing of aluminum-bronze suture through muscle tissue. (Suture first used by Victor Veau.)

The next step (Fig. 15) is to denude the borders of the cleft and insert interrupted sutures in the nasal mucous membrane. The ends of these sutures are left long and are not tied until the insertion of the antitension intramuscular aluminum-bronze suture first suggested by Victor Veau, of Paris. While a catgut suture may be substituted for this, we do not advise it. This suture is placed as shown in Figure 16.

The interrupted sutures passed on the nasal mucous membrane are now tied. The two ends of the wire suture, passed

submucously around the muscle tissue, are twisted together so as to bring the flaps in intimate contact at the midline. The separated ends of the superior constrictor muscle are now in their proper relationship. No necrosis accompanies the use of this suture. We regard this aluminum-bronze suture as the most important item in cleft palate surgery (Fig. 17).

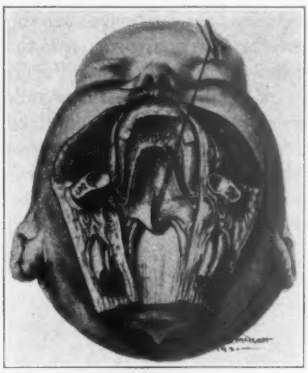

Fig. 17.—Intramuscular wire suture in place and silk coaptation sutures in nasal mucous membrane.

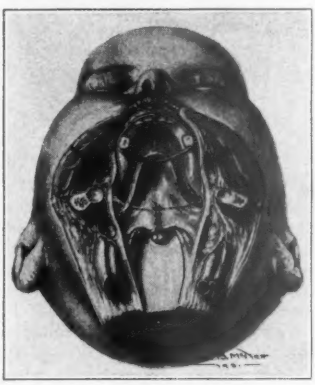

Fig. 18.—Cleft palate completely closed at end of push-back operation. The wire support is applied across the palate and around the maxillary teeth to hold the displaced palate upward against the bone.

The oral mucous membrane is united with coaptation sutures. The anterior extremity of the displaced palate is held against the denuded palatal vault with a suture passed through the bone. A further support is obtained by passing a heavy piece of silver wire behind the cuspid or between the molars, then across

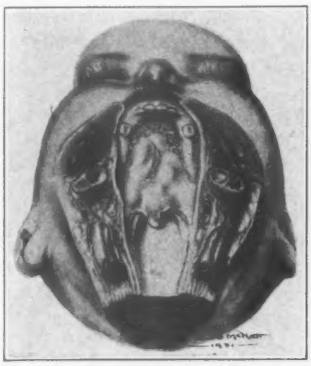

Fig. 19.—Healed palate after push-back operation. The denuded bone has completely filled with granulation tissue. The cleft anterior segment of the pharyngeal ring has been restored, thereby restoring the split palatopharyngeal sphincter.

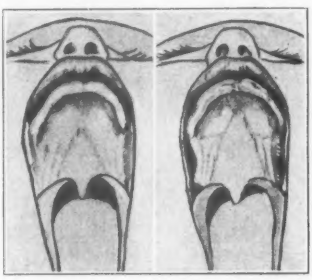

Fig. 20.—Left: Submucous split of velum in which split involves muscle tissue alone, the palatal mucous membrane being intact. *B*, submucous split palate in which split runs through hard and soft palate.

the palate and behind the same teeth of the opposite side, with wire of sufficient length so that the two ends can be molded around the dental arch, meeting in front of the incisors where the ends are twisted together and turned back over the incisors (Fig. 18). Iodoform gauze is then placed between this wire splint and the united palate, where it exerts slight pressure, prevents tongue

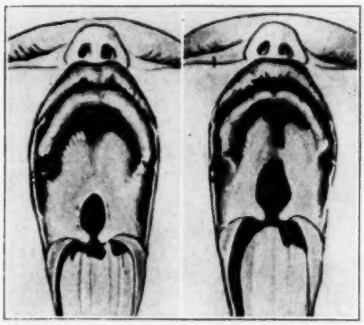

Fig. 21.—Splits of velum.

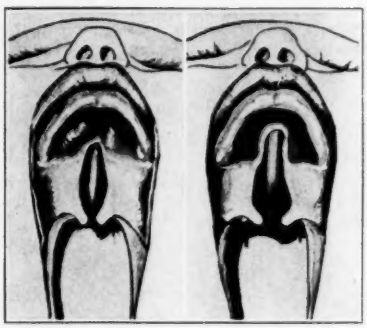

Fig. 22.—Left: Splits of palate. The defect involves the hard palate in part. Right: Split of palate. The defect extends as far forward as the incisive fossa.

contact and supports the flap. This gauze is renewed after four days and is finally discarded when the palatal flap has adhered to the denuded bone. The denuded bone at the site of the relaxation incision becomes covered with granulation tissue (Fig. 19).

We feel that the "push-back" operation should be used in cases with congenital shortening of the palate (Fig. 20), cleft velum (Fig. 21) and cleft palate which extends as far forward as the junction of the anterior third with the middle third of the hard palate (Fig. 22). In these cases, the operation accomplishes complete restoration of the palate. We have found the "push-back" operation invaluable in reclaiming the palates of patients on whom the usual cleft palate operation has been performed and the

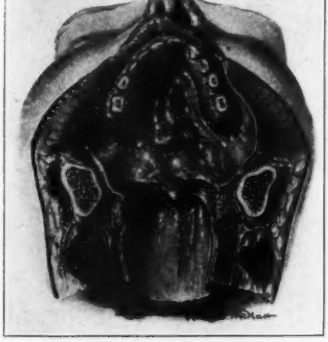

Fig. 23.—Case shown in Figure 22; after push-back operation. The palate has been lengthened and therefore the palatopharyngeal sphincter is enabled to close the nasopharynx. The holes in the anterior portion of the hard palate will close after cauterization. If these holes persist, they can easily be covered with a plate made of vulcanite.

shortened palate fails to restore normal speech. When a defect in the anterior portion of the hard palate exists after the "push-back" operation, we advise an obturator plate to which is attached any missing teeth (Fig. 23).

In patients with lip-jaw-palate splits, no primary operation for closing the

breach in the alveolar ridge is necessary. Repair of the split lip will suffice because the normal pressure of the repaired lip will in time restore the continuity of the alveolar ridge.

In cases of complete lip-jaw-palate splits in which the soft tissue is of adequate length, a modified von Langenbeck procedure is performed after the cleft in the lip is closed and the breach in the alveolar ridge restored. In brief, this modification consists of division of the hamuli to release the lateral tension produced by the tensor palati muscles and the extending of the relaxation incisions over the pterygomandibular folds, the application of the submucous muscle suture of Victor Veau and the use of the two-stage procedure. If we find that satisfactory speech does not follow with sufficient promptness after operation on account of a shortened palate, we then do a "push-back" operation.

It has been our experience that unless we obtain successful closure of the palate and establish a fairly near normal velopharyngeal closure, the speech will always betray the fact that the patient has had a cleft palate.

It has likewise been our experience that a large percentage of adults, even when these foregoing conditions are attained, will need speech training to get away from the faulty habits developed prior to operative interference.

We will not argue the old question as to when is the best time to operate in cleft palate cases, but we will state our opinion that the "push-back" operation should not be attempted under the age of 5 years.

We seldom operate before that time and will often wait six months or longer in cases in which the operation might jeopardize the child's general health. As stated before, if the repair is performed in two stages, there will be less partial or complete failure.

In conclusion, let us reiterate that the "push-back" operation is not advocated in every case of cleft palate. It is our belief that it offers the best chance for obtaining good functional results in cases of short palate regardless of whether this shortening is congenital or the result of previous operative procedures.

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# DECIDUOUS TEETH AND THE DISEASES OF CHILDHOOD*

By ROBERT C. ELLIS, D.D.S., and MIRIAM LUTEN, M.S., Portland, Ore.

IT is so generally accepted that oral sepsis may have an etiologic relationship to such diseases as the arthritides, rheumatic heart disease, nephritis and chorea that the dentist and internist are inclined not to temporize with known infected permanent teeth. It is well known that, after devitalization of the pulp, the deciduous teeth frequently develop apical abscesses. The loss to the individual through the extraction of a permanent tooth is in being deprived of the tooth itself, the functions of which can be quite satisfactorily taken over by an artificial substitute. In the premature extraction

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of a deciduous tooth, the loss of the masticatory function is temporary and of relatively slight importance, but a serious effect of such extraction is the frequently resulting malocclusion of the permanent teeth and the attendant facial deformity.

Unlike the abscessed permanent tooth, the infected deciduous tooth often secures drainage through a fistulous opening in the adjacent alveolus and gum tissue or through carious exposure of the pulp. Where such drainage is not present, an artificial opening into the root canal will generally accomplish the same result.

Owing to these differences in conditions presented by the abscessed deciduous tooth and the abscessed permanent tooth, it seemed to us incorrect to assume that the two problems should be treated alike. The *a priori* assumption that infected deciduous teeth are as often etiologically related to the various diseases of children which are generally supposed to be of focal origin as are infected permanent teeth in the adult is wrong in principle and may result in bringing about serious conditions which can be avoided. The brief study reported in this paper was undertaken because of our belief that the subject merits specific investigation.

A survey of the literature reveals surprisingly few reports of investigations on this subject. Smith[1] studied 109 cases of abscessed deciduous teeth, giving his principal attention to the bacteriology of the apices. He found streptococci in forty-eight cases. Eight cases were reported as sterile. The remainder had staphylococci, *Bacillus pyocyaneus,* pneumococci, Vincent's organisms and diphtheroid bacilli. Smith injected rabbits with all of his streptococcus strains. Of the forty-eight animals inoculated, five showed multiple abscesses of the kidney; one, cardiac muscle involvement; one, brain tissue involvement, and four, joint lesions. In each instance, streptococci were recovered in culture from the lesions. No evidence of selective localization was observed. Smith regards this production of eleven infections in the forty-eight animals as evidence of the seriousness of the original dental infection and believes that the abscessed deciduous tooth should be extracted, the malocclusion which might result being of secondary consideration.

Aside from Smith's paper, the authors have found no actual research on this

TABLE 1.—DISTRIBUTION OF INFECTED TEETH AND TONSILS IN CHILDREN IN RELATION TO CLINICAL DIAGNOSIS

| Group | Clinical Characteristics of the Group | Total Number of Children in Group | Number Having Abscessed Deciduous Teeth Only | Number Having Infected Tonsils Only | Number with Infected Teeth and Tonsils |
|---|---|---|---|---|---|
| I | Definite diagnosis of general disease | 17 | 0 | 8 | 9 |
| II | General disease suspected but not proved | 48 | 3 | 38 | 7 |
| III | General disease not present | 36 | 12* | 8 | 16 |

*In eight of these cases, the condition of the tonsils was not known.

1. Smith, A. L., and Ludwick, R. W.: Bacterial Findings in 107 Cases of Abscessed Teeth in Children, Nebraska M. J., 4:131 (May) 1919.

subject, though the literature is abundant in opinions. It seems to be the concensus of these opinions that the abscessed deciduous tooth should be extracted. Many authors have cited single cases in which the extraction of an abscessed deciduous tooth was followed by speedy recovery from rheumatic heart disease, nephritis or chorea. Such limited and uncontrolled observations are of little value. Rosenow[2] stresses the probable importance of dental foci of infection as feeders of infection to the tonsils through the lymphatic flow, the direction of which he states favors such transmission. Henke[3] made an extended study of this problem and arrived at this conclusion also.

The present investigation was carried out on the patients in a small children's hospital and on children attending the outpatient clinic of the same institution. We wish to make it clear at the outset that the amount of clinical material subjected to study was not large enough to justify us in drawing far-reaching conclusions from our findings. We offer it here only as a small addition to the observations in a field that appears to have been much neglected.

There were two objectives of our study. One was by routine clinical and dental examination of patients to obtain data that might throw light statistically on the etiologic relationship of apical infection of deciduous teeth to general disease. The other was by bacteriologic study of the infected apices to secure evidence that would at least have an indirect bearing on the problem. The attainment of both of these objectives was, of course, complicated by the necessity of taking into account other possible foci of infection. Since in children these are limited largely to the tonsils, these structures were subjected to study also.

Owing to the generous cooperation of the departments of pediatrics and otolaryngology, it was possible to reduce our

TABLE 2.—ORGANISMS CULTURED FROM THE APICES OF INFECTED DECIDUOUS TEETH, FROM FISTULAS AND FROM INFECTED TONSILS IN CHILDREN

| | Teeth and Fistulas | Total Teeth Cultured Per Cent | Tonsils | Total Tonsils Cultured Per Cent |
|---|---|---|---|---|
| Total number cultures | 50 | | 75 | |
| Organisms | | | | |
| Streptococcus viridans | 46 | 92 | 62 | 82.0 |
| Streptococcus hemolyticus | 7 | 14 | 29 | 39.0 |
| Nonhemolytic streptococcus | 5 | 10 | 37 | 49.0 |
| Staphylococcus aureus | 2 | 4 | 27 | 35.0 |
| Staphylococcus albus | 23 | 46 | 32 | 43.0 |
| Gram-negative cocci | 10 | 20 | 33 | 44.0 |
| Pneumococcus | 0 | 0 | 2 | 2.6 |
| Diphtheroids | 3 | 6 | 0 | 0.0 |
| B. coli | 1 | 2 | 1 | 1.3 |
| Bacterium mucosum-capsulatum | 0 | 0 | 1 | 1.3 |
| B. subtilis | 1 | 2 | 0 | 0.0 |

2. Rosenow, E. C.: Studies on Elective Localization, J. D. Res., 1:205-268 (Sept.) 1919.

3. Henke, Fritz: Neue experimentelle Feststellungen über die physiologische Bedeutung der Tonsillen, Arch. f. Laryn. u. Rhin. 28:230-255, 1914.

procedure to a simple routine. All patients admitted were given a medical examination by the pediatrics staff and a dental examination in the department of dental medicine. When the medical diagnosis included any of the general conditions previously referred to, the patient was sent to the department of otolaryngology, and the tonsils, if found diseased, were removed. All teeth found to have apical infections were extracted regardless of the medical diagnosis. Both teeth and tonsils were studied bacteriologically.

General anesthesia was employed for all extractions. When tonsillectomy was performed on the same patient, the two operations were carried out at the same time. The technic of extraction for culture was as follows: The tooth *in situ* was isolated and dried, scrubbed with tincture of iodine, washed with 70 per cent alcohol and dried with warm air. Sterile forceps were used for extraction, and while the tooth was still held in the forceps, the apex was excised with sterile excising forceps and dropped into a tube of brain broth. In most cases, while the patient was still anesthetized, a few cubic centimeters of blood was taken for agglutination tests. In tonsillectomy

TABLE 3.—RELATION TO THE DIAGNOSIS OF THE AGGLUTININ TITER IN PATIENTS' SERUMS FOR AUTOGENOUS ORGANISM

| Strain | Source of Culture | Highest Dilution of Patient's Serum Causing Agglutination | Diagnosis |
|---|---|---|---|
| Pneumococcus | Tonsils | 1:512 | Hypertrophy of tonsils and adenoids |
| Streptococcus viridans | Teeth | 1:256 | |
| Streptococcus viridans | Tonsils | 1:512 | Mitral stenosis |
| Streptococcus viridans | Teeth | 1:128 | |
| Streptococcus viridans | Teeth | 1:512 | Malnutrition |
| Staphylococcus albus | Teeth | 1:64 | |
| Streptococcus viridans | Teeth | 1:128 | Hypertrophy of tonsils and adenoids |
| Streptococcus viridans | Teeth | 1:64 | Mastoiditis |
| Streptococcus hemolyticus | Teeth | 1:128 | Joint pains |
| Streptococcus viridans | Teeth | 1:64 | Poor posture, carious teeth |
| | | 1:32 | |
| Streptococcus viridans | Teeth | 1:8 | Anorexia |
| Streptococcus hemolyticus | Teeth | 1:32 | Hypertrophy of tonsils and adenoids |
| Streptococcus viridans | Teeth | 1:16 | Hypertrophy of tonsils and adenoids |
| Micrococcus catarrhalis | Tonsils | 1:8 | |
| Streptococcus viridans | Teeth | 1:8 | Acute rheumatic fever |
| Staphylococcus albus | Teeth | 1:8 | |
| Streptococcus viridans | Teeth | 1:16 | Psychoneurosis |
| Staphylococcus albus | Teeth | 1:16 | |

cases, the tonsils were dropped into a sterile bottle and sent with the blood and brain broth which contained the tooth apex to the department of bacteriology. Here, material from the brain broth medium was streaked on blood-agar plates and both cultures were incubated forty-eight hours at 37 C. The tonsils were washed in sterile saline solution and ground in sterile sand.

This ground material was then inoculated into brain broth mediums and streaked on blood-agar plates. From these preparations, the bacteria present were obtained in pure culture and identified. The streptococci were classified both according to their effect on the blood in a blood-agar plate and according to Holman's classification by fermentation of lactose, salicin and mannitol serum water mediums. Other species were identified by the generally accepted morphologic and cultural tests. Agglutination tests with the patients' serums were made only with the patients' own organisms and with these only when satisfactory

TABLE 4.—CORRELATION BETWEEN LESIONS PRODUCED IN RABBITS BY INOCULATION OF CULTURES FROM DECIDUOUS TEETH AND INFECTED TONSILS AND THE DIAGNOSIS

| Lesions in Rabbits | Number of Animals Inoculated | Source of Culture | Diagnosis |
|---|---|---|---|
| None found | 1 | Tooth | Caries, cleft palate, heart murmur of unknown origin |
| None found | 1 | Tooth | Chronic sinusitis, primary tuberculosis |
| None found | 3 | Tooth | Hypertrophy of tonsils and adenoids |
| None found | 2 | Tonsils | Hypertrophy of tonsils and adenoids |
| None found | 1 | Tooth | Chronic sinusitis, hypertrophic adenoids |
| None found | 1 | Tonsils | Hypertrophy of tonsils, swelling of cervical glands |
| Subacute bacterial endocarditis | 1 | Tooth | Hypertrophy of tonsils and adenoids |
| Pericarditis, lung abscess, empyema | 1 | Tooth | Hypertrophy of tonsils and adenoids, swelling of cervical glands |
| Abscess in parenchyma of kidney | 1 | Tooth | Acute hemorrhagic nephritis |
| Cloudy swelling with hydropic degeneration of tubules | 1 | Tooth | Acute hemorrhagic nephritis |
| Cloudy swelling with hydropic degeneration of tubules | 1 | Tooth | Mastoiditis, hypertrophy of tonsils and adenoids, caries |
| Cloudy swelling with hydropic degeneration of tubules | 1 | Tooth | Hypertrophy of tonsils and adenoids |
| Cloudy swelling with hydropic degeneration of tubules | 1 | Tonsils | Swelling of cervical glands |
| Cloudy swelling with hydropic degeneration of tubules | 1 | Tonsils | Hypertrophy of tonsils and adenoids |
| Cystitis, dilated ureters, pyelonephritis | 1 | Tooth | Hypertrophy of tonsils and adenoids |
| Sterile purulent exudate in joints | 1 | Tooth | Normal activity, anorexia nervosa |
| Sterile purulent exudate in joints | 2 | Tooth | Hypertrophy of tonsils and adenoids |
| Swollen joints with exudate containing B. coli | 1 | Tooth | Acute hemorrhagic nephritis |
| Swollen joints with exudate containing B. coli | 1 | Tonsils | Mastoiditis, caries |
| Swollen joints with exudate containing Streptococcus viridans | 1 | Tonsils | Hypertrophy of tonsils and adenoids, swelling of cervical glands |

permanent suspensions could be obtained. In these tests, dilutions of the patient's serums of from 1:4 to 1:256 were added to equal amounts of infusion broth cultures of the organisms, incubated two hours at 55 C. and allowed to stand in the cold room overnight. Readings were made both at the end of the two-hour incubation period and the next morning. The animal experimentation was done by intravenous injection of 4 c.c. of the original 24-hour brain broth culture into rabbits. Animals that survived were killed after three weeks. All animals were given a careful postmortem examination, including the culturing of lesions and histologic study of doubtfully diseased tissues. If conclusions of any value can be drawn from these studies, it would seem that they can be most clearly brought out by presenting our results under the two headings: (1) clinical data and (2) bacteriologic data.

TABLE 5.—RELATION OF LESIONS PRODUCED IN RABBITS BY INOCULATION OF CULTURES FROM TEETH AND TONSILS FROM SAME PATIENT

| Lesions Produced by Tooth Cultures | Lesions Produced by Tonsil Cultures |
|---|---|
| Subacute bacterial endocarditis | No pathologic change |
| No pathologic change | Cloudy swelling and degeneration of renal tubules. |
| Cloudy swelling and degeneration of the renal tubules | Exudate into right wrist and knee joints, left elbow containing B. coli |
| No pathologic change | Sterile exudate into right knee joint |
| Pericarditis, lung abscess and empyema | Exudate into knee joints, and left elbow containing Streptococcus viridans; degeneration of renal tubular epithelium |

### CLINICAL DATA

A study of the clinical material handled in our work resolves itself chiefly into an attempt to determine, on a purely statistical basis, whether any relation exists between cases of general disease having their origin in localized infectious processes and apical infection of deciduous teeth. As in most clinical studies of this kind, we found the interpretation of our data complicated by uncertainties of diagnosis and by the presence of influences other than those under study.

A total of ninety-eight children were studied. In connection with our problem, it was necessary to divide these into three clinical groups:

Group I. Those having diseases generally recognized as due to localized foci of infection (seventeen cases).

Group II. Those whose histories or symptoms were strongly suggestive of such diseases, present or past, but in whom the diagnosis could not be definitely established (forty-eight cases).

Group III. Those in whom the abovementioned diseases were definitely excluded (thirty-six cases).

Group I includes cases of rheumatic fever, joint diseases, pyelitis and nephritis. Group II includes cases with histories of rheumatic fever attacks, but without recognizable lesions, cases with doubtful history of chorea and heart disease and cases with "growing pains," but without joint lesions. Group III includes those with diagnoses of hypertrophic tonsils and adenoids, anorexia, malnutrition, carious teeth and other minor abnormalities.

An examination of these three groups with respect to the incidence in each of infected teeth and tonsils gives us all the clinical information that is significant in our study. Table I contains the available data.

While the number of cases examined is certainly too small to allow of sweeping conclusions, several points are worth noting about these data. In the seventeen cases with definite diagnoses of disease of focal origin, the patient had tonsils proven diseased, while nine had accompanying infected deciduous teeth. If we consider both Groups I and II as having diseases of focal origin, we find all but three of the sixty-five cases had diseased tonsils, while only nineteen had infected teeth. Only three of these sixty-five children had the sole focus of infection in the teeth, and these three belong to the group in which the presence of general disease was not definitely established. In the thirty-six cases in which general disease is definitely excluded, we find twenty-four with infected tonsils and twenty-eight with infected teeth. Of the latter, four were free from other foci of infection. We see, then, that of the cases in which general disease was either established or suspected, 29 per cent had infected teeth and 97 per cent diseased tonsils; while in the group without disease of focal origin, 77 per cent had apical abscesses and 67 per cent tonsillar infection.

It is not presumed that the much higher incidence of infected teeth in the latter group is significant, since this group contains children having conditions which might be expected to predispose them to tooth decay. The important factor in these figures, we believe, is that, of the cases having diseases in which focal infection is accepted as the etiologic factor, by far the larger number had sound teeth, while all of them—three cases of doubtful diagnosis excepted—had infectious foci in the tonsils. While this does not establish the infected tonsils as the sole etiologic factor in these cases nor entirely exclude the teeth as causatively related to those cases having dental infections, it at least lends no positive support to the thesis that apically infected deciduous teeth frequently constitute the foci of infection from which serious general disease is acquired. Regarding the possible rôle of tooth infections in causing or keeping alive tonsillar infection, something will be said in connection with the bacteriologic studies.

### BACTERIOLOGIC DATA

The bacteriologic studies undertaken involved three types of investigation: (1) a qualitative determination of the species of organism found in abscessed apices of deciduous teeth and in excised tonsils from cases of general disease; (2) determinations of agglutinins in the blood of patients for the specific organisms isolated, and (3) a study in a limited number of cases of the lesions produced in rabbits by intravenous inoculation of the primary brain broth cultures of teeth and tonsils.

Data from the qualitative study of the bacterial flora of the abscessed teeth and diseased tonsils are given in Table 2.

It is seen from these data that the types of bacteria found in the infected apices of deciduous teeth do not differ in any significant way from those found in infected permanent teeth as abundantly reported in the literature. (Gilmer and Moody[4] and Hartzell and Henrici[5] pub-

4. Gilmer, T. L., and Moody, A. M.: Study of Bacteria of Alveolar Abscesses and Infected Root Canals, J.A.M.A., 63 (Dec. 5) 1914.

5. Hartzell, T. B., and Henrici, A. T.: Study of Streptococci from Pyorrhea Alveolaris and from Apical Abscesses, J.A.M.A., 64 (March 27) 1915.

lished results of cultures on teeth which are representative of the greater number of reports given.) The list is not very different, in fact, either qualitatively or quantitatively from what one would expect to find in examining the normal flora of the mouth and nose. The streptococci were the predominating organisms, one or more types being found in all teeth cultured except four. Of these, the green-producing varieties were most common, being present in 92 per cent of the cultures, while hemolytic types were present in only 14 per cent of the cases. As might be expected, *Staphylococcus albus* showed the next highest incidence, being present in 46 per cent of teeth examined. More than one species was found in many of the cultures, though streptococci alone were present in eighteen, or 36 per cent. From these facts and from a study of the animal inoculations, discussed more fully below, it seems clear that the infecting organisms in these deciduous tooth abscesses are not of the types that are expected to have a high virulence or invasive power. Undoubtedly, their association with the infection is due to their presence in the mouth at a time when exposure of the pulp had opened the tooth apex to infection.

The qualitative distribution of organisms in the diseased tonsils studied is roughly similar to that found in the teeth. The only difference worth noting is that hemolytic varieties of streptococci were found much oftener in the tonsils and the green-producing types less often. If a comparison is made between the species of organisms found in the infected teeth and tonsils of the same persons, there is seen to be little agreement. Even when *Streptococcus viridans* or *Streptococcus hemolyticus* was found in both, a classification of these by Holman's method showed them to belong as often to different as to like types. This would seem to lend no support to the hypothesis that tonsil infection in these cases was to any marked degree secondary to tooth infection.

Agglutination tests with patients' serums carried out against autogenous organisms were made with a total of thirty-two serums. Only specimens from patients having infected teeth were employed, but these were tested against organisms isolated from both teeth and tonsils. As noted above, these tests were made with dilutions of the serums of from 1:8 to 1:512. A total of 101 tests were made and agglutinins were demonstrated in some dilution against eighteen different strains. The others were negative even in the lowest dilution tested. Of the eighteen positive tests, eleven agglutinated only in dilutions of the serums of 1:64 or below and only seven in dilutions higher than this. Of those agglutinating only in dilutions of 1:64 or below, six were nonhemolytic streptococci. Of those agglutinating in higher dilutions, all but two were nonhemolytic streptococci. Of these two, one was a pneumococcus and the other a hemolytic streptococcus. In view of the previous demonstration of normal agglutinins in human serum for heterogenous streptococci,[6] it would seem that we can disregard the lower dilution group. If now we study the higher dilution group in relation to the place from which it was isolated and the diagnosis, we are forced to conclude that there is no correlation between the demonstration of a higher agglutinin content in the patient's serum for an autogenous organism and clinical evidence that the organism is invading the patient's tissues. Table 3 gives the data from which this conclusion is drawn.

The animal inoculation studies like-

6. Nicholls, Edith E., and Stainsby, W. J.: Streptococcal Agglutinins in Rheumatoid Arthritis, J.A.M.A., 97:1146 (Oct. 17) 1931.

wise yielded no evidence of an etiologic relationship between the organisms isolated and the diagnosis. Seventeen of the primary brain broth cultures from abscessed teeth and seven from tonsils were injected intravenously into rabbits and the animals were observed and examined as described above. Table 4 gives the significant facts brought out in this study.

It was further noted that, in the five cases wherein both tooth and tonsil cultures were inoculated into rabbits, there was no relation between lesions produced from the tonsil and those from the tooth cultures.

## COMMENT*

It may be suggested that the report of results in this series of abscessed deciduous teeth, which differs materially from the report of similar abscesses affecting permanent teeth, may possibly be accounted for by the differences in the surrounding bone and the roots themselves. These variations are developmental and histologic and may be associated with the development of the unerupted permanent teeth which are to replace the deciduous teeth. Differences also exist in drainage and other clinical phenomena.

It is not suggested from the results of this investigation that abscessed deciduous teeth are to be regarded as harmless. The progress of necrosis into deeper tissues has been known at times to favor, if not be entirely responsible for, grave results.

*By Arthur W. Chance, D.D.S., M.D., Head of Department of Dental Medicine, University of Oregon Medical School.

## SUMMARY

Study of the clinical data shows that most of the children with abscessed deciduous teeth had infected tonsils as well, and that the incidence of infected teeth in cases in which general disease was either proved or suspected was no greater than in those in which general disease was not present.

Cultures from abscessed deciduous teeth yielded only species characteristic of the normal flora of the mouth and resembled qualitatively those reported by other observers in infected permanent teeth, both showing a predominence of streptococci and staphylococci.

No demonstrably close relationship was observed between the species found in the infected teeth and the tonsils of the same person.

Agglutination reactions with the patients' serums furnished no evidence of etiologic relationship between teeth and tonsil organisms and disease in the patient.

Injection of tooth and tonsil cultures into animals produced lesions that bore no anatomic relationship to disease in the patient from whom they came.

# IMMEDIATE DENTURES*

By LEONARD S. FLETCHER, D.D.S., Castle Shannon, Pa.

ONE of the most important strides made in modern dentistry within the past few years has been the development of the immediate dentures. Although not entirely a new phase of dentistry, it has been called to the attention of the dental profession at large only within the last few years. They should not only be recommended, but also their use should be insisted on in all cases suitable for this type of service.

When a patient comes in for an examination with the expectation of being informed that he requires only minor services, such as a few fillings, a crown, prophylaxis, etc., what a shock it must be to be told that the only thing that can be done is to extract all of his remaining teeth and insert dentures. The first question is, "How long must I be without teeth?" Our answer should be, "No longer than the time required to insert them after your teeth have been extracted. In other words, the dentures will be made before we do the final extracting, and then inserted immediately after the last tooth has been removed and the mouth prepared to receive the dentures."

The removal of teeth may be rightly termed "causing a deformity," which, if neglected, will cause considerable disturbance to the human body. Why allow this deformity to remain when, by the insertion of immediate dentures, it can be corrected? Immediate dentures require far less time and are easier to make than other dentures.

* Read at the Midwinter Clinic of the Chicago Dental Society, Feb. 28, 1934.



### ADVANTAGES OF IMMEDIATE DENTURES

*Protection of the Alveolus Against Trauma and Infection.*—Food and oral secretions are prevented from entering the tooth socket, since the denture acts as a gate over the openings, preventing such entrance.

*Prevention of Hemorrhage by Supporting the Blood Clot.*—Regardless of the condition of the blood or how much bleeding there may have been after previous extractions, by suturing the gums (or, if necessary, by cauterizing with the electric cautery or with trichloracetic acid), the hemorrhage will cease in a few minutes after the dentures have been inserted.

*More Rapid Healing and Less Postoperative Pain.*—Because infection is prevented and the tissue is kept clean and covered with a healthy blood clot, healing begins almost immediately. Patients who have returned for postoperative treatment state that they have had practically no pain, and are amazed at the comfort they experience. With the dentures inserted, the pressure is on the posterior part of the ridge where the teeth have been previously extracted. The tissue is capable of withstanding some force rather than pressure, since it is not applied on the so-called green area. This is brought about by so arranging the teeth as to prevent direct pressure over the recently extracted area.

*Prevention of Distortion of the Facial*

*Outline.*—By the immediate insertion of dentures, the tone of the tissue is not lost, the original intermaxillary space is retained and the general outline of the muscles of expression is unaltered.

*Less Resorption, Resulting in a More Dense Ridge.*—If it were possible to measure the exact amount of absorption of the ridge when the posterior teeth have been extracted and no substitute has been inserted for some time, then to extract the anterior teeth and immediately insert a denture and, after a year, measure the amount of absorption that took place in both regions, it would be found that the absorption in the posterior region was much greater than that in the anterior region. This may be due to the ability to place the artificial teeth in the same relationship to the crest of the ridge as the natural teeth were, or to maintain the exact intermaxillary distance, or to the fact that the patient has had no chance to create any abnormalities whatever.

*Unchanged Enunciation.*—A patient allowed to remain edentulous for some time must learn an entirely new method of enunciation, which requires considerable time. Then, after the insertion of dentures, the same procedure must be repeated. If immediate dentures are inserted, the patient will experience practically no change whatever.

### TECHNIC OF PREEXTRACTION RECORDS

The preextraction record is of vast importance whether or not we make any type of denture, as it may be needed by the dentist for his own protection as well as for a guide for future work in the individual case.

### IMPRESSION MATERIALS

The original impression material used for this work was compound. For the working cast, compound was also used, but the sectional technic was employed, in order to remove the impression from the malposed, rotated or undercut areas. The introduction of elastic impression material has greatly added to the improvement and accuracy of impressions for this type of work, as well as for one-piece castings, there being no better impression material than dentocoll when used where indicated and with the correct technic in the individual case. It is just as important that the right material and technic be selected for immediate work as when making the other type dentures.

### TRAYS

The perforated dentocoll tray is by no means satisfactory without definite alterations. The trays most suitable for immediate impressions are (1) the cast individual tray, (2) the sectional compound tray and (3) an aluminum tray of a good fit, with which we can take a compound impression, muscle trim and then use a dentocoll wash.

The cast individual tray is the least bulky and the most acceptable one to the patient, and the one to be used when there are present deep undercuts or many malposed or rotated teeth, or where a great thickness of dentocoll is indicated. The compound impression with a dentocoll wash is indicated when there are certain areas requiring compression, the compound being added or cut away as indicated before the dentocoll is used.

The sectional compound tray is indicated for the closed mouth, compound impression technic.

The compound impression correctly made with a dentocoll wash can be applied to the greater number of cases, and the technic is recommended for the inexperienced operator.

### TECHNIC IN STEPS

1. The oral tissues and teeth should be examined for pathologic conditions.

Note should be made of any muscle attachment which might interfere with the stability of the denture, especially of the frena and the muscle under the malar bone. All infected teeth and infected areas in the mouth should be charted.

2. The facial dimensions obtained by the use of the dentoprofile scale are recorded on the graphic profile chart.

3. The distance is measured from the bridge of the nose to the base of the chin; from the bridge of the nose to the incisal edge of the upper anterior teeth; from the incisal edge of the lower teeth to the base of the chin; from the labial of the upper teeth to the mainstem of the dentoprofile scale; from the labial of the lower central incisors to the mainstem of the dentoprofile scale, and from the upper lip at the base of the nose to the main stem of the dento-profile scale; from the most protrusive point of the inferior margin of the upper lip to the mainstem of the dentoprofile scale; from the most protrusive point of the superior margin of the lower lip to the mainstem of the dentoprofile scale; from the most depressed area midway between the superior margin of the lower lip and the base of the chin.

The last four dimensions permit us to record graphically the exact contour of each patient's face or profile from the base of the nose to the base of the chin.

4. A plaster cast is made of at least the labial surface of the upper and lower anterior teeth.

5. Centric occlusion and right and left lateral bites in wax are next taken for the purpose of mounting the casts and setting the condyles.

6. A good compound or "dentocoll" impression is taken of all the natural teeth and record casts made of plaster and mounted on the articulator.

7. The shade of the teeth and the approximate mold are selected. This concludes the preliminary work, which is followed by the first surgical procedure; namely, the extraction of all infected teeth and the posterior teeth. The patient is then discharged and allowed about ten days or two weeks to build up or regain bodily resistance.

From this time on, until the patient returns, a duplicate record cast or casts may be made, the posterior teeth cut away and a tray made or selected for use in taking the final impression, that is, the impression from which the working casts are to be made. (The working casts are those upon which the dentures are completed.)

### SECOND APPOINTMENT

At the second appointment, a thorough examination is made of the work previously done in the mouth, including a recheck of the shade selected, in order to satisfy oneself that the shade is correct, and that the mouth is in good condition to take the impression from which the final casts are to be made. It should be remembered that up to this time the natural teeth (anterior) are still in the mouth.

### IMPRESSION TECHNIC

1. The two impression technics most generally used are a compound impression, correctly trimmed, with a "dentocoll wash," or one in which a cast individual tray is muscled trimmed with compound in the mouth, and the impression completed with dentocoll. The cast individual trays are made by adapting black boxing wax over the casts from which the posterior teeth have been cut away. This wax is dusted freely with talcum powder, and a sheet of baseplate wax adapted over this powdered wax. The baseplate wax is removed, invested in flasking plaster and cast with a low-fusing metal. The cast tray is recovered and

the excess and sharp areas are trimmed off. The tray is cleaned and tried in the mouth, the operator making sure it will not ride on any movable tissues. A small roll of soft compound is adapted to the periphery of the tray and muscle trimmed in the mouth. It is then removed, the excess compound trimmed away and the surface of the tray roughened with hot compound for the "dentocoll" attachment.

2. The compound and "dentocoll" impression is made by taking a good compound impression in the mouth, including all areas upon which the denture is to rest. The impression is removed just before the compound sets.

3. All undercuts are relieved around the remaining teeth.

4. The trimmed impression is then muscle trimmed and postdammed in the mouth. The corrections indicated should be made at this time.

5. In this impression, a dentocoll wash is used. By using compound as a tray, and a "dentocoll" wash, a more detailed impression is obtained than with straight "dentocoll." A denture made from this type of impression affords retention by adaptation and adhesion rather than by over-compression of tissues as with other materials. By all means, the tissue around the periphery must not be displaced or overcompressed, as overcompression will interfere with the blood and nerve supply. Displacement of tissue will interfere with the retention of the denture. From this impression the working casts are made.

6. In order to mount the working casts in centric occlusion, a roll of soft compound is placed in the mouth over the crest of the ridge and the patient closes in centric occlusion. These blocks are chilled thoroughly in the mouth, then transferred to the casts and used as bite-block registers to mount the casts on the articulator. The condyles of the articulator on which the working casts are mounted are now set to correspond with those on the articulator on which the record casts have been mounted. One may likewise use the original facebow transfer record, or make a new record for mounting the working casts. A good baseplate is then adapted to the casts, the biterims are made and the posterior teeth are set up in wax for trying in, just as in making a partial upper and lower denture.

7. The partial set-up is checked in the mouth and the bite checked and corrected at this point, should any discrepancy be noted. In order to prevent distorting the baseplates or trial set-up of the posterior teeth in checking the bite in the mouth, a rigid palatal bar is adapted to the upper cast about in the line of the second molars. The adapted baseplate is placed on the cast, the palatal bar being heated, and is then laid over the baseplate at the above mentioned point and pressed to place against the cast. The same precaution is taken with the lower cast by using a lingual bar to reinforce the baseplate of the lower back of the remaining anterior teeth. As a bar material, I prefer a piece of stock lingual bar metal. It being very rigid, there can be no pulling away of the baseplate from the tissue or the casts. The placement of this palatal bar in all upper baseplates when not using a rigid base will save one considerable time and occasionally a remake or excessive spot grinding and milling-in of the completed dentures.

In order to set the artificial teeth in the same relationship to the crest of the ridge as the natural teeth were, a piece of copper wire is contoured over the incisal edge of the anterior teeth and through the sulci of the posterior teeth of the original cast, and transferred to the biteblock on the working cast, where it is used as a guide

to establish the cranial relationship of the artificial teeth.

8. The bite being correct, we proceed to set up the remaining teeth. I prefer to cut off one or two teeth at a time from the plaster cast, scraping enough from the labial aspect of the cast to permit space for the thickness of the labial rim over the ridge lap of the teeth, and the base of the dentures. In my opinion, all dentures should have a labial rim, as this adds considerably to the stability and comfort of the dentures, as one depends greatly on peripheral adaptation for retention. When trimming off the anterior teeth, one should not trim beyond the lingual curvature at the gingival line of the teeth. One should not hesitate to remove enough of the labial rim of the working cast when setting up the anterior teeth. It is necessary to keep in mind that the average thickness at the neck of the anterior teeth labiolingually is 6 mm. Then if a little of the labial plate or bone is removed, and added to the dimension of 6 mm., there will be a thickness of approximately 9 mm. It is safe, therefore, to remove as much as 9 mm. from the labial rim of the working cast at the crest of the ridge, and to taper the rim sharply to a height of about 9 mm., or 5 mm. for the average cast. These dimensions pertain to the upper cast only. The lower is trimmed proportionately less.

Areas of the cast or impression requiring relief are: 1. The anterior and posterior palatine foramen. 2. The bony prominence in the median line, as well as other areas requiring relief. 3. The spine, if present, at the posterior of the median line. 4. The labial frenum. 5. The anterior limit of compressible tissue. 6. The anterior limit of the postdam. 7. The extreme limit of the denture.

The lower cast requires relief for: 1. The labial and lingual frenum. 2. The mental foramen. 3. The impression, if the crest of the ridge is sharp. 4. The area of the lower cast to be postdammed. 5. The mylohyoid ridge or spine. (Overextension usually means trouble.)

The dentures are completed, and the patient is asked to return for the extraction of the remaining teeth and the insertion of the finished dentures.

If the operator does not do the extracting himself, as an aid for the exodontist a transparent celluloid matrix is conformed over a duplicate cast from the one on which the denture is to be completed, and given to the exodontist, who will use it as a guide in trimming off the proper amount of process. After the teeth have been extracted, the celluloid matrix may be inserted to locate any portion of the process still requiring removal.

These dentures are by no means temporary, and whenever it is possible, they should certainly be recommended in all denture cases suitable for this work.

The success of this work depends on (1) correct diagnosis; (2) the age and cooperation of the patient; (3) the making of good impressions and casts; (4) proper facebow registration; (5) correct mold and shade of teeth; (6) trimming of the correct amount of plaster from the labial aspect of the working cast (very important); (7) balanced occlusion at all cost; (8) proper peripheral adaptation and (9) proper relief of the rest of the denture.

# FIRST PERMANENT MOLAR: ITS CONDITION AT BIRTH AND ITS POSTNATAL DEVELOPMENT*

By RUDOLF KRONFELD, B.S., M.D., D.D.S., Chicago, Ill.

THIS paper is based upon a study of serial histologic sections through more than two dozen human jaw specimens from subjects ranging in age from birth to 15 years. These specimens were originally studied by W. H. G. Logan to ascertain the development and position of the deciduous and permanent tooth germs in infancy, to determine the topographic relationship between upper and lower jaws and to study those relationships between the jaws and other oral structures, such as the tongue, palate, lips and cheeks, that have a bearing on problems of oral surgery, function and phonetics.

More than five years ago, when the first sections were studied, the location and development of the tooth germs were found to be at variance with the data and descriptions found in standard dental textbooks. For over a century, there have been wide discrepancies among the opinions of many recognized authorities on fundamental problems in dental development. This uncertainty made it necessary to study many specimens systematically in order to determine more accurately the degree of development of the human dentition at various ages and the changing topographic relationship between deciduous and permanent teeth from birth to the time of eruption.

*Read at the Midwinter Clinic of the Chicago Dental Society, March 1, 1934.

*From the Research Department of the Chicago College of Dental Surgery, Dental Department of Loyola University.

For technical reasons, the findings have been divided into a number of reports dealing with different phases and aspects of the study, with their application to various problems of dental science.[1]

My present report deals with the following questions: When does the first permanent molar begin to calcify? How does the occlusal surface of this tooth develop? When is the crown fully formed and the enamel matured? How do the occlusal fissures of this tooth develop and what is their significance?

First, the findings and opinions of various dental authorities on some of these problems will be briefly reviewed, and then our own findings will be reported.

## THE LITERATURE

John Hunter[2] (1771), in discussing the formation of the permanent teeth in the lower jaw, says: "The pulp of the

1. Logan, W. H. G.: Disc. of Lyons, C. J.: Etiology of Cleft Palate and Cleft Lip and Some Fundamental Principles in Operative Procedure, J.A.D.A., 17:835 (May) 1930. Logan, W. H. G.: Tr. Eighth Internat. D. Cong., August, 1931. Kronfeld, Rudolf: D. Cosmos, 74:103 (Feb.) 1932; Deutsche Monat. f. Zahnheilk., 50:97, 1932. Logan, W. H. G., and Kronfeld, Rudolf: Development of Human Jaws and Surrounding Structures from Birth to Age of Fifteen Years, J.A.D.A., 20: 379 (March) 1933. Logan, W. H. G.: Histologic Study of Anatomic Structures Forming Oral Cavity, J.A.D.A., 22:3 (Jan.) 1934.

2. Hunter, John: Treatise on Natural History and Diseases of Human Teeth, London, 1771.

first adult incisor and of the first adult molares begin to appear in a foetus of seven or eight months; and five or six months after birth the ossification begins in them."

Bell[3] (1831), a countryman of Hunter, is of a markedly different opinion on this subject. He says: "Of the permanent teeth those which are first formed are the anterior molares, the first point of ossification on which may be seen at birth."

In Robert Owen's work[4] (1840-1845), we find the following statement, which is identical to Hunter's data: "Calcification of the permanent series commences first in the pulp of the first true molar, and very soon after, if not simultaneously, in that of the anterior incisor, about five or six months after birth. . . ."

In the first American edition of the textbook of Fox and Harris[5] (1846), the postnatal development of the human dentition is described at length and is illustrated by woodcuts. Fox and Harris describe the calcification of the first permanent molar as taking place at about the time of birth: "At the time of birth ossification has commenced upon their highest points." They illustrate the tooth germs present in the jaws of a new-born child and show the beginning calcification of the crowns of the upper and lower first permanent molars.

John Tomes[6] (1859), in illustrating a series of dry bone preparations showing the development of the jaws and teeth from birth on, gives no evidence of calcification of the upper or lower first permanent molars in either a 9-months fetus or in a child of 2 months.

The most thorough of the earlier studies on tooth development was that of Emile Magitot. This French author published in 1873, in collaboration with Legros,[7] the first part of his famous treatise on the origin and formation of the dental follicle of the mammalians, which appeared in the *Journal de l'Anatomie et de la Physiologie*. This paper contains a table, *Chronologie du follicule dentaire chez l'homme* ("Chronolgy of the Dental Follicle in Man"), covering the complete development of the deciduous and permanent dentition. This publication of Magitot and Legros was translated into English by Dean[8] in 1880. It is to be found in some of our most recent dental textbooks.

In Legros and Magitot's table, the onset of hard tissue formation in the first permanent molar was put at the sixth month of fetal life (twenty-fifth week).

In American dental literature, Magitot's work was first considered by Peirce[9] (1887), whose first table seems to be based almost entirely upon Magitot's data. Also, in Peirce's[10] second publication on the subject of tooth calcification (1884), which contains the famous graphic representation of calcification that has found its way into a greater number of textbooks than any other similar table, the onset of calcification is given at the twenty-fifth week of fetal life.

G. V. Black[11] (1883) does not state

3. Bell, Thomas: Anatomy, Physiology, and Diseases of Teeth, Philadelphia: Carey & Lee, 1831.

4. Owen, Richard: Odontography, London: Hippolyte Bailliere, 1840-1845.

5. Fox, Joseph, and Harris, C. A.: Diseases of Human Teeth, Philadelphia: Lindsay and Blakiston, 1846.

6. Tomes, John: System of Dental Surgery, Philadelphia: Lindsay and Blakiston, 1859.

7. Legros, Charles, and Magitot, Emile: Jour. de l'Anat. et de la Physiol., 5:449, 1873.

8. Legros, Charles, and Magitot, Emile: Origin and Formation of the Dental Follicle, Chicago: Jansen, McClurg and Company, 1880.

9. Peirce, C. N.: D. Cosmos, 19:399 (Aug.) 1877.

10. Peirce, C. N.: D. Cosmos, 26:450 (Aug.) 1884.

11. Black, G. V.: Frontispiece, Tr. Ill. State D. Soc., 1883.

specifically when the first permanent molar begins to calcify. He merely indicates, in this early diagram, as well as in the later modified representation in his textbook on operative dentistry[12] (1908), that the cusps of this tooth are present at birth. He says: "The calcification of this tooth has usually begun at birth. I have made examinations of many cases of stillbirth at term and in but few have I found a failure of the beginning of calcification of this tooth."

The appearance of the Legros and Magitot table was followed by a number of reports on tooth development by French investigators whose interest had been stimulated by Magitot's work. Although these men generally used the table of Legros and Magitot as a foundation, their reports are markedly different in various respects. Debierre and Pravaz[13] (1886), for instance, found no calcification of the first permanent molar at birth. They describe a very small calcified cap in this tooth at the age of 2 months.

In Röse's first publication on the development of human teeth[14] (1891), we find the following statement: "In the new-born child of 46½ cm. in length that I have examined, the first permanent molar showed, contrary to the statements of other authors, not a trace of any calcification." Röse stresses the point that his findings in this respect differ from the opinion of other authors. This seems to indicate that then, just as now, there was a general tendency to antedate the onset of calcification of the first permanent molar. He continues: "In the mandible of another new-born child of the Anatomical Institute which I have just examined, the pulp of the first permanent molar shows five well developed coronal horns, but only on one of them a minute cap of enamel and dentin. Therefore, one may well assume *that the earliest calcification of this tooth takes place at about the time of birth.*" (Italics in original.) Röse adds that the height of the hard tissue cap on the first permanent molar of the new-born child is about "½ mm."

In Zuckerkandl's contribution[15] to the first edition of Scheff's *Handbuch der Zahnheilkunde* (1891), the first permanent molar at birth is described as having "very small calcified caps on the tips of the cusps."

Berten[16] (1895), whose study of calcification of the permanent teeth is based upon dissections and upon the relative incidence of enamel hypoplasia, found individual calcified caps upon the tips of the cusps of the upper and lower first permanent molars at birth. These caps were 1 to 1.5 mm. high.

Broomell[17] (1898), who gives a detailed description of the development and structure of the teeth in his textbook, says, with reference to the calcification of the upper and lower first permanent molar: "Calcification begins from four centers about one month before birth."

The beginning of the twentieth century brought a new means of studying calcified structures, namely the roentgen rays. In his roentgenographic study of the development of the human skeleton during prenatal life, Lambertz[18] (1900)

12. Black, G. V.: Work on Operative Dentistry, Chicago: Chicago Medico-Dental Publishing Co., Vol. I, Ed. 1, 1908.

13. Debierre, Charles, and Pravaz, J.: Arch. d. Physiol. Norm. et Pathol., 2:40, 1886.

14. Röse, Carl: Arch. f. Mikr. Anat., 38: 477, 1891.

15. Zuckerkandl, E.: Makroskopische Anatomie, in Scheff's Handbuch der Zahnheilk., Vol. I, Vienna: Alfred Hölder, 1891.

16. Berten, J.: Deutsche Monat. f. Zahnheilk., 13:425, 483, 533, 587, 1895.

17. Broomell, I. N.: Anatomy and Histology of Mouth and Teeth, Philadelphia: P. Blakiston's Son and Co., 1898.

18. Lambertz: Supp. I to Fortsch. auf dem Gebiete der Roentgenstrahlen, Hamburg: Gräfe, 1900.

gives the following data in some very clear and instructive roentgenograms: In an embryo of 9 months, no evidence of calcification of the first permanent molars is visible. In the mandible of a new-born child, there is one very small point of calcification, located in the anterior portion of the alveolus of the first permanent molar, near the second deciduous molar. A similar condition is seen in a vertical view of the skull and upper jaw of a new-born child. Here, too, there is a minute area of calcification in one cusp which is smaller than the corresponding amount of calcification in the mandibular first permanent molar.

In the atlas of Witzel[19] (1907), we find several roentgenograms of the jaws of new-born children. In a photograph of the upper jaw in a vertical direction, four small individual centers of calcification corresponding to the individual cusps may be seen. The roentgenograms of the mandible of a new-born child show calcification of only the tips of two mesial cusps.

In the atlas of Symington and Rankin,[20] a roentgenogram of the jaws of a new-born infant of 19 inches (48 cm.) is reproduced, showing one calcified cusp in the crypt of the lower first permanent molar. The accompanying legend reads: "The antero-lateral cusp of its contained papilla has just commenced to calcify." Practically the identical statement is found in Colyer[21] (1911), who describes one of the anterior cusps of the first mandibular molar calcified at birth.

19. Witzel, Karl: Entwicklung der Kiefer und der Zähne beim Menschen, Berlin-Dresden: Zentralstelle f. Zahnhygiene, 1907.

20. Symington, Johnson, and Rankin, J. C.: Atlas of Skiagrams, London: Longmans, Green and Co., 1908.

21. Colyer, J. F.: Dental Surgery and Pathology, Ed. 3, London: Longmans, Green and Co., 1911.

In 1922, Gantz[22] published the following important data on the calcification of the first permanent molar: In a fetus 41.5 cm. in length, in the thirty-third week of prenatal life, a small calcified area could be observed in the buccomesial cusp. In a full term new-born child, three small points of calcification were found, corresponding to the location of the mesiobuccal, mesiolingual and distobuccal cusps.

During the past ten or twelve years, the onset of calcification of the first permanent molar has been discussed in a number of textbooks. Some of the authors confirm the observation of Röse and Symington and Rankin by stating that, at birth, one tip, usually the mesiobuccal, is found calcified (Eidmann[23] [1923], Mummery[24] [1926], Churchill[25] [1932], Meyer[26] [1932]). Others refer to the table of Magitot and Legros (Bödecker[27] [1926], Noyes[28] [1929]). Noyes states that the calcification of the first permanent molar has begun by the ninth month.

Bunting[29] (1929) makes the following statement: *"In roentgenographic and*

22. Gantz, S. J. Z.: D. Cosmos, 64:131 (Feb.) 1922.

23. Eidmann, Hermann: Die Entwicklungsgeschichte der Zähne des Menschen, Berlin: Meusser, 1923.

24. Mummery, J. H.: Microscopic and General Anatomy of Teeth, Ed. 2, London: Oxford University Press, 1926.

25. Churchill, H. R.: Human Odontography and Histology, Philadelphia: Lea & Febiger, 1932.

26. Meyer, Wilhelm: Lehrbuch der normalen Histologie und Entwicklungsgeschichte der Zähne des Menschen, Munich: J. F. Lehmann, 1932.

27. Bödecker, C. F.: Fundamentals of Dental Histology and Embryology, New York: Macmillan Company, 1926.

28. Noyes, F. B.: Text-Book of Dental Histology and Embryology, Ed. 4, Philadelphia: Lea & Febiger, 1929.

29. Bunting, R. W.: Textbook of Oral Pathology, Philadelphia: Lea & Febiger, 1929.

***surgical examinations of over 25 normal new-born and still-born, the author found that in not a single instance was there any indication of calcification in the first permanent molars, the first tooth of this series to develop. The dental follicle of the permanent teeth consisted solely of soft embryonic tissue in which no enamel or dentin had been formed.*** (Italics in original.)

Brady[30] (1906, 1924), in illustrating the condition of the deciduous and permanent teeth between the seventeenth fetal week and adult life in drawings, shows the calcification of four tips of the upper and lower first permanent molars at the twenty-fifth fetal week. In the fortieth week (at birth), the four cusps are united, forming the entire occlusal surface. Brady's data were used by two Viennese authors, Tandler and Sicher, for two series of diagrams on tooth development, the first of which appeared in Tandler's "Textbook of Anatomy"[31] (1923), the second one in Sicher and Tandler's "Anatomy for Dentists"[32] (1928). Both tables of diagrams show four centers of calcification present in the first permanent molar in the twenty-fifth fetal week. Both show the cusps of the first permanent molar united and the occlusal surface formed at birth.

A roentgenographic study of postnatal tooth development was reported by Bustin, Leist and Priesel[33] in 1929 and 1930. These authors examined living healthy children, beginning with the age of 3 weeks and continuing with a great number of intermediate stages throughout childhood. These are their findings concerning the first permanent molar: In a normally developed child of 3 weeks, no calcification could be seen roentgenographically. At 1 month, the first trace of calcification was visible. At 3 and at 6 months, individual centers of calcification could be noted, which were beginning to become fused in a child of 7 months and were definitely fused at 9 months.

From these findings and from numerous dissections of jaws of new-born and very young infants, Bustin, Leist and Priesel come to the conclusion that there is no calcification present in the first permanent molar at birth. They also call attention to the wide discrepancy between their own findings and the diagram of Brady. A comparison between Brady's table and the roentgenographic findings of Bustin, Leist and Priesel show that the condition drawn by Brady for the first permanent molar at birth is found roentgenographically in children 11 or 12 months of age.

A study very similar to the one just mentioned was reported by Hess, Lewis and Roman[34] (1932). These authors were apparently not familiar with the work of Bustin, Leist and Priesel, for they state in the introduction to their paper: "To our surprise, we have been unable to find any record of a radiographic study of the teeth of infants and children." Hess, Lewis and Roman found, in regard to the first permanent molars, that "at birth these teeth are almost completely uncalcified, showing occasionally a tip of calcium at one of their cusps, the cusp adjacent to the second deciduous molar being involved." They

30. Brady, W. J.: Chart of Average Time of Development, Eruption, and Absorption of Teeth, Published by author, Kansas City, 1924.

31. Tandler, Julius: Lehrbuch der Systematischen Anatomie, Leipsic: F. C. W. Vogel, 1923.

32. Sicher, Harry, and Tandler, Julius: Anatomie für Zahnärzte, Vienna: Julius Springer, 1928.

33. Bustin, E.; Leist, M., and Priesel, R.: Fortschr. a. d. Gebiete d. Röntgenstrahlen, 40:80, 1929; 41:49, 1930.

34. Hess, A. F.: Lewis, J. M. and Roman, Benjamin: D. Cosmos, 74:1053 (Nov.) 1932.

add: "This has been the rule with but slight variation." When these roentgenographic findings were checked by anatomic dissection, "The first molar teeth were found to be still entirely uncalcified except for the tips of one or possibly two cusps. The crown was not calcified, as judged both by appearance and by palpation." In a premature child of about 30 fetal weeks, there was no calcification whatsoever of the first permanent molar. On the whole, the roentgenographic findings of Hess, Lewis and Roman fully confirm those reported by Bustin, Leist and Priesel.

This study was further enlarged on by a chemical analysis of the calcified portions of the teeth of full-term stillborn infants. The authors found that the calcified portion of the first permanent molar contained 0.3 mg. of calcium and 0.15 mg. of phosphorus, which is only about 0.1 per cent of the total amount of calcium and phosphorus present in an erupted molar. In the summary of their paper, Hess, Lewis and Roman come to the conclusion that calcification of the first permanent molars and other permanent teeth must be regarded as a postnatal rather than as a prenatal phenomenon.

In 1929, Aoki,[35] of Tokyo, reported an extensive roentgenographic and anatomic study of tooth development in eighty fetuses and 160 infants and children (Japanese). The first onset of calcification of the first permanent molar was found roentgenographically "at the ninth month of fetal life or at about the time of birth."

From the work of Aoki and from a study of recent American and European investigations, one comes to the conclusion that the onset of calcification of the first permanent molar is rather constant all over the world, at least in the temperate zones. It occurs either during the last month of intrauterine life or during the first one or two months of postnatal life. In the majority of the people of the white race, calcification commences very shortly after birth, during the first month of infancy.

The much quoted age, "twenty-fifth fetal week," which dates back to Legros and Magitot, has not been corroborated by any single finding during the more than sixty years that have elapsed since Magitot's original publication.

### SUMMARY OF DATA FOUND IN LITERATURE CONCERNING ONSET OF CALCIFICATION OF FIRST PERMANENT MOLAR

Calcification is definitely a prenatal phenomenon according to Magitot, Peirce and Brady, all giving the twenty-fifth fetal week as the time of beginning calcification.

Calcification begins shortly before birth and several small individual points of calcification are present at birth according to Fox and Harris, Zuckerkandl, Berten, Broomell, Witzel, Gantz and Aoki.

Calcification begins at birth or one (mesial) cusp is found calcified at birth according to Bell, Röse, Lambertz, Symington and Rankin, Black, Colyer, Mummery, Eidmann, Meyer and Hess, Lewis and Roman.

Calcification is definitely a postnatal phenomenon according to Hunter, Owen, Tomes, Debierre and Pravaz, Fischer, Bunting and Bustin, Leist and Priesel.

### ROENTGENOGRAPHIC AND HISTOLOGIC FINDINGS CONCERNING THE CONDITION OF THE FIRST PERMANENT MOLAR AT BIRTH

The term "at birth" or "term fetus" is of only relative value in determining the degree of bodily development. There

35. Aoki, Teiryo: Tr. Nippon D. A., 1933, p. 77.

are marked individual variations between different new-born infants, not only in the body weight, but also in the degree of calcification of the bones, as well as in other respects. Any attempt to lay down a standard for the dental structures of the new-born will, therefore, be futile, unless exact data are available giving the birth weight, size and other somatic characteristics of the child from whom in dental development, and the twenty first permanent molars contained in these jaws, together with the numerous first permanent molars of children from 2 weeks to several months of age, give a fair indication of the average condition of this tooth at term.

Roentgenograms were taken of all these jaws before decalcification. The assertion has frequently been made that

TABLE 1.—ROENTGENOGRAPHIC APPEARANCE OF FIRST PERMANENT MOLAR IN JAW SPECIMENS DURING FIRST SIX MONTHS OF LIFE

| Age | Upper First Permanent Molar | Lower First Permanent Molar |
|---|---|---|
| New-born (three specimens) | No calcification | No calcification |
| New-born | No calcification | Calcification of buccomesial cusp, 0.5 mm. high |
| New-born | Calcification of buccomesial cusp, 0.3 mm. high | Calcification of buccomesial cusp, 0.5 mm. high |
| 2 weeks | No calcification | No calcification |
| 18 days | Calcification of buccomesial cusp, 0.3 mm. high | Calcification of buccomesial cusp, 0.3 mm. high |
| 4 weeks | No calcification | No calcification |
| 6 weeks | No calcification | Calcification of buccomesial cusp, 0.5 mm. high |
| 6 weeks | No calcification | No calcification |
| 2 months | Calcification of buccomesial cusp, 1.5 mm. high | Three centers of calcification, 0.5 to 1.5 mm. high |
| 2 months | Four centers of calcification, 1 to 2.5 mm. high | Four centers of calcification, 1 to 2 mm. high |
| 3 months | Four centers of calcification, 1.5 to 2.5 mm. high | Five centers of calcification, 1 to 2.5 mm. high |
| 5 months | Three centers of calcification, 1 to 2.5 mm. high | Four centers of calcification, 0.5 to 1.5 mm. high |
| 6 months | Four centers of calcification, 2 to 3 mm. high | Five centers of calcification, 1.5 to 2.5 mm. high |

the specimen has been obtained. Unfortunately, such data are, in most instances, not available. The best that I and, judging from the literature, others working along the same line have been able to obtain were jaw specimens with the annotation, "new-born infant" or "term fetus." The five human jaws that I have observed which fall in this group show a remarkable degree of uniformity there is a marked difference between the roentgenographic and the anatomic (i.e., histologic) findings in the calcification of teeth during infancy. I have not found this to be true in the roentgenographic examination of the jaw specimens from which all the investing soft tissues had been removed. Wherever beginning calcification was found histologically in a cusp of a first permanent molar, particu-

larly in the lower jaw, a corresponding minute ∧-shaped shadow could be found in the roentgenogram, although it was sometimes necessary to use a magnifying glass or to enlarge the film before it could be clearly seen.

The accompanying table gives the roentgenographic data obtained from our human specimens.

Two typical roentgenograms of lower first molars at birth are shown in Figure 1. In the case illustrated in Figure 1, above, no evidence of calcification of the first permanent molar is visible. In Figure 1, below, one cusp, the buccomesial, can be clearly recognized. This picture is identical to the one found in the atlas of Symington and Rankin[20] (new-born female infant 48 cm. in length). The histologic section corresponding to the roentgenograms in Figure 1 is shown in Figures 2 and 3.

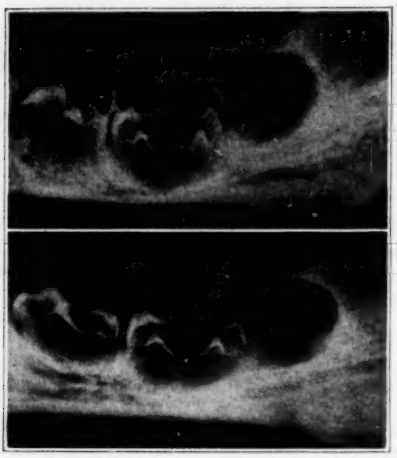

**Fig. 1.—Lower first permanent molars in new-born infant. Above: No evidence of calcification. Below: Small center of calcification corresponding to mesiobuccal cusp.**

At this time, I should like to discuss a criticism that has been voiced against the type of specimens used in this study, a criticism that may be brought up again in connection with the present report, i.e., that our investigations are based upon "pathologic material," upon the jaws of children that cannot be considered normal.

This criticism could be easily led *ad absurdum* by saying that all science of human embryology, histology and anatomy, with very few exceptions (material obtained from surgical operations and from executions), is based upon the same type of material that we are using, that is, from persons who died of various diseases. The methods of histologic and embryologic technic used in the study of

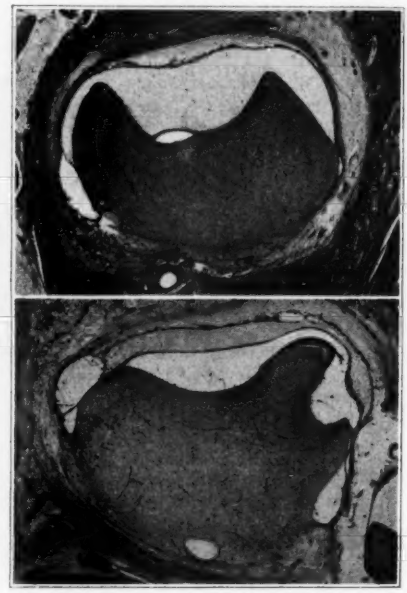

**Fig. 2.—Sections through lower first permanent molar in new-born infant. Above: Buccolingual section; no evidence of hard tissue formation. Below: Mesiodistal section through the buccal cusps; small cap of enamel and dentin on the buccomesial pulp horn. (×8.)**

animal tissues, for obvious reasons, will never be applicable to man.

The main point that I wish to make is that the findings in our previous reports, as well as those in the present paper, are not based upon the examination of one or two specimens, but upon the systematic study of nearly thirty human jaws of various ages. Some of these were from still-born infants at term, others from children who died after prolonged illness, and again others from children who succumbed to an acute, short illness; and while there are individual variations, the average data from all of these findings are just as close to the standard average as any data and measurements of human organs and structures. It will be most helpful and desirable to have a verification or check-up of the data brought forth in this and previous publications by a systematic roentgenographic examination of living children of known history. Thus far, the roentgenographic findings of Bustin, Leist and Priesel[33] and of Hess, Lewis and Roman[34] are fully in accord with the condition of calcification of the deciduous and permanent teeth during infancy that we have observed in histologic specimens of corresponding ages. We are looking forward with great anticipation to the results of Dr. Broadbent and his associates from the Bolton Foundation, whose data will help us to evaluate and, whenever necessary, to correct our anatomic-histologic data.

From the accompanying table, it is evident that we have to consider either the complete absence of calcification or

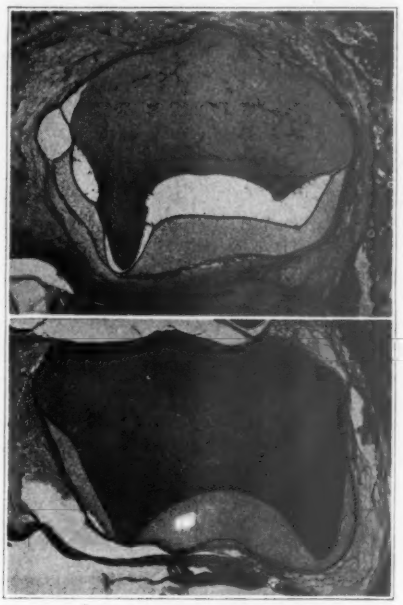

Fig. 3.—Sections through upper first permament molar in new-born infant. Above: Buccolingual section; small cap of enamel and dentin on mesiobuccal cusp. Below: Horizontal section through mesial cusps; no evidence of hard tissue formation. (×8.)

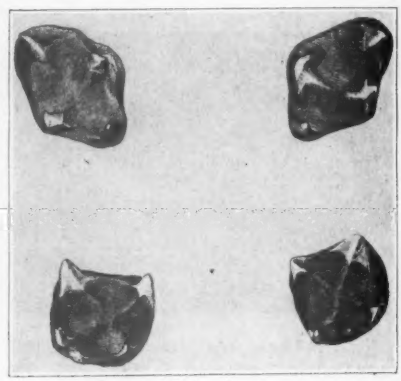

Fig. 4.—First permanent molars of child of 4 weeks. (From Röse, 1892.) Above: Upper first permanent molars. Below: Lower first permanent molars. The position of the centers of calcification in the periphery of the occlusal surface is to be noted. The central fossa still consists only of soft tissue.

the presence of one center of calcification in the buccomesial cusp as the average condition of the lower first permanent molar at birth. Both these conditions are illustrated in Figure 2. Above, a buccolingual section through the mesial portion of the molar can be seen. The tooth germ is located in the mandible and is not covered by bone on the occlusal side nor is it separated by bone from the mandibular nerve and vessels, but the latter lie in a shallow groove at the bottom of the primitive alveolus. (I am using the terminology of Norberg[36] who calls the bony crypt containing an unerupted tooth germ "primitive alveolus.") The tooth germ itself consists of a large mass of

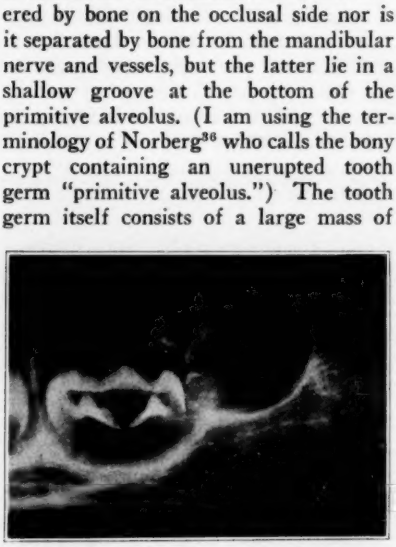

Fig. 5.—Lower first permanent molar at 2 months; one large center of calcification, corresponding to mesiobuccal cusp, and two small centers corresponding to distobuccal and mesiolingual cusps.

pulp tissue and enamel organ. In two points, corresponding to the mesiobuccal and mesiolingual cusps, the pulp shows two horns which extend close to the outer enamel epithelium.

In a mesiodistal section through the lower first permanent molar of another new-born child, a small cap of enamel and dentin can be seen on the buccomesial pulp horn (Fig. 2, below). The height of the calcified portion is about 1 mm., its greatest thickness, 0.25 mm. The other pulp horns are well formed, but no hard tissue deposition has yet taken place.

The germ of the lower first permanent molar, like the germs of all lower molars, points mesially and lingually, both the mesial and the lingual inclination of the

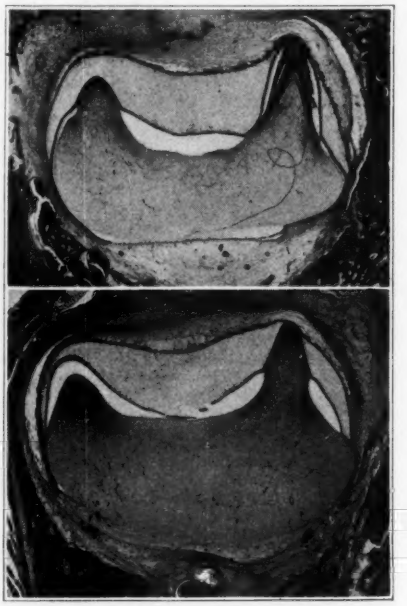

Fig. 6.—Sections through lower first permanent molar at 2 months. Above: Buccolingual section through mesial cusps. The calcified portion of the mesiobuccal cusp (right) is about four times as high as that of the mesiolingual cusp (left). The distance between the two centers of calcification is to be noted. Below: Buccolingual section through distal cusps; small cap of enamel and dentin on distobuccal cusp (right); no calcification in distolingual cusp (left). (×8.)

vertical axis of the germ being about 15 degrees.

The upper first permanent molar at

36. Ztschr. f. Anat. u. Entw.-gesch., 100: 394, 1933.

birth has practically the same degree of development as the lower. There is either no calcification at all, or a delicate cap of enamel and dentin has been formed in the buccomesial cusp (Fig. 3, above). The primitive alveolus is wide open on the occlusal side, and whereas, in the mandible, the alveolar crest extends at least part way over the occlusal surface of the first permanent molar, the occlusal side of the upper molar has no bone covering it. The primitive alveolus points buccally and distally. The germ itself occupies a corresponding position of buccal and distal inclination, the buccal inclination being about the same as the lingual of the corresponding lower tooth, that is, 15 degrees. The distal inclination is more pronounced and mounts to from 20 to 25 degrees, if measured on anteroposterior (sagittal) sections through the upper jaw. Because of this marked distal inclination during the early months of life, in cutting horizontal sections through the upper jaws of children of this age, the two mesial cusps are first to be seen on an occlusal level. Later, on a considerably higher level, the two distal cusps are visible (Fig. 3, below).

Fig. 7.—Mesiodistal section through buccal cusps of lower first permanent molar at 2 months. The distance between the two centers of calcification, corresponding to the mesiobuccal and distobuccal cusps, is to be noted. (×8.)

### POSITION AND DEVELOPMENT OF THE CENTERS OF CALCIFICATION OF THE FIRST PERMANENT MOLAR; FORMATION OF THE OCCLUSAL SURFACE AND THE CROWN

At the time of birth, the germ of the first permanent molar consists of a soft mass of enamel organ and pulp. In four points in the upper and in four or five points in the lower molars, the pulp horns extend close to the outer enamel epithelium. At these points, deposition of dentin and enamel takes place.

At birth, one center of calcification corresponding to the buccomesial cusp is sometimes found.

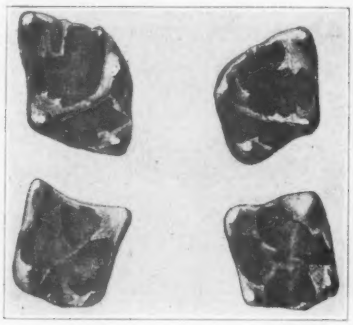

Fig. 8.—First permanent molars of a child of 6 months. (From Röse, 1892.) Above: Upper first permanent molars. Below: Lower first permanent molars. The position of the centers of calcification, which is identical to that shown in Figure 4, is to be noted. The individual centers have become fused along the marginal ridges and, in the upper molars, across the occlusal surface (oblique ridge).

At the age of 2 months, there are from three to five separate small centers of calcification, the largest of which is the one in the buccomesial cusp. At 6 months, the individual calcified caps have increased in diameter and are ready to become fused along the periphery of the occlusal surface. In the upper molars,

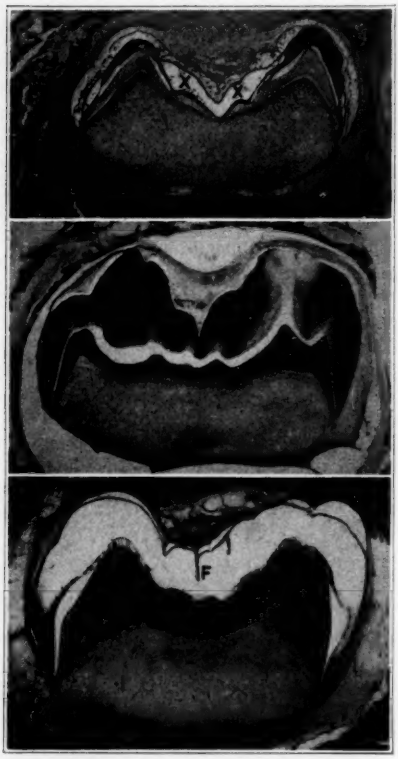


Fig. 9.—Three successive stages in development of crown of lower first permanent molar. Above: Stage 1. At 9 months, the mesiobuccal and distobuccal cusps have just become united along the buccal marginal ridge. The presence of two small tubercles of enamel (*x*) on either side of the point of union of the cusps is to be noted. Center: Stage 2. At 15 months, most of the enamel is present in an immature stage of development. Owing to the development of the tubercles on both sides of the line of union of the cusps, a typical fissure has developed between the cusps. Below: Stage 3. At 1½ years, the occlusal portion of the crown is completed, but enamel formation is still going on in the cervical portion of the crown. The occlusal fissure (*F*) contains soft tissue (enamel epithelium), which has remained after the enamel has been dissolved in the preparation of the specimen. (×6.)

the distobuccal and the mesiolingual cusps first become united by a bridge of dentin and enamel along the future oblique ridge.

The fusing process of the cusps of the molars, and of the pluricuspidate teeth in general, has of necessity aroused the interest of various investigators. Black[37] (1902) expresses this opinion in the description of the calcification of the upper first permanent molar: "In their origin, each *lobe* begins its calcification as a separate piece, plate, or cusp, and moves apart from the other as growth proceeds, till the proper dimensions of the occlusal surface are attained; then the plates coalesce on the lines marked by the grooves named above, and thus complete the occlusal surface."

Bödecker[27] (1926) and Noyes[28] (1929) illustrate in diagrams two small calcified caps lying at first very close to each other. In the course of development, they are shown to grow and at the same time to move apart. Bödecker states that the two tiny cusps of the future tooth are at first quite close together, and that later they become enlarged and move away from one another, until they have reached their normal position and then become united. (In a more recent schematic drawing which appeared in Hyatt's book,[38] Bödecker illustrates the formation of the occlusal surface differently: The two cusps, from the beginning of calcification to its completion, maintain the same distance from each other.) Noyes describes this process as follows: "When enamel formation begins, these points are close together, but they are carried farther apart by the growth of the dental papilla."

37. Black, G. V.: Descriptive Anatomy of Human Teeth, Ed. 4, Philadelphia: S. S. White Dental Manufacturing Co., 1902.

38. Hyatt, T. P.: Prophylactic Odontotomy, New York: Macmillan Co., 1933.

On the other hand, in an article by Röse[39] (1892) dealing with the formation of the human molars, we find a drawing of the upper and lower first permanent molar at the age of 4 weeks showing four and five small centers of calcification placed upon the very edge of the large, flat, disk-shaped occlusal surface in a position which corresponds to the location of the centers of the future cusps. The entire large central portion encircled by the calcified caps still consists of soft tissue (Fig. 4, Röse).

Beust[40] reported a similar observation in the developing molars of the pig. He writes: "Calcification begins at segregated points removed from one another, the distance between the denticles corresponding approximately to the future position of the matured cusps. This observation disagrees in a measure with the teachings of recent textbooks, which hold that the denticles are originally in apposition and subsequently travel apart."

I have measured the distances between the individual pulp horns of molars shortly before calcification, after the first onset of calcification, and also the distance between the highest points of dentin in the cusps after the latter had become united. The results of these measurements were then compared with the figures obtained by measuring the distance between the summits of the dentinoenamel junction of the individual cusps of fully developed upper and lower molars of adults.

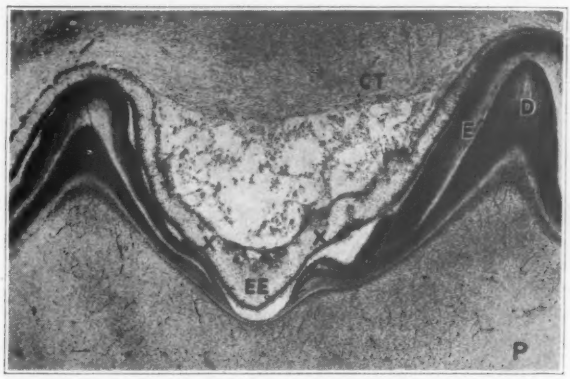


Fig. 10.—Mesiodistal section through buccal cusps of developing lower first permanent molar. At the deepest point, the cusps are bridged by a thin layer of dentin, but the enamel has not yet become fused in this area. *P,* pulp; *D,* dentin; *E,* enamel; *EE,* enamel epithelium; *CT,* connective tissue. The tubercles of enamel and dentin (*x*) on the mesial and distal sides of the line of union of the cusps are to be noted. By their rapid growth, these tubercles cause the formation of the occlusal fissures. (×15.)

This comparison shows one thing: There is no active moving apart of the centers of calcification of the first permanent molar after hard tissue formation has started. The uncalcified pulp and enamel organ of this tooth grow and expand until the pulp horns are as far apart as the future tips of dentin in the individual cusps. Then hard tissue formation begins. Each pulp horn at the time

39. Röse, Carl: Anat. Anzeiger, 7:392, 1892.
40. Beust, T. B., Intrafollicular Enamel Development, J.A.D.A., 15:2021 (Nov.) 1928.

of calcification has reached its final position, and it stays there throughout the formation of the occlusal surface. The centers of calcification coalesce by growing toward each other without any change in their relative position.

Figures 5-7 illustrate the condition of a lower first permanent molar at the age of 2 months. The roentgenogram of this tooth reveals three centers of calcification, corresponding in their arrangement to the mesiobuccal, distobuccal and mesiolingual cusps (Fig. 5). The mesiobuccal calcified portion appears almost twice as large as the other two, a condition which is commonly found and which

Fig. 11.—Development of occlusal surface of human molar. Above, left: Centers of calcification in their final location, corresponding to a mesial and distal pulp horn. (Compare Figs. 6 and 7.) Above, right: Centers of calcification united; appearance of tubercles of enamel and dentin next to point of union. (Compare Fig. 9, above.) Below, left: Advanced deposition of enamel. The fissure is formed by a relative retardation of amelogenesis between the cusps and by a rapid growth of the tubercles on either side of this area of retardation. (Compare Fig. 9, center, and Fig. 12, center.) Below, right: Crown fully formed. (Compare Fig. 9, below, and Fig. 12, below.)

is clearly shown in Röse's illustration (Fig. 4).

In a buccolingual section through the two mesial cusps, small calcified caps can be seen on each pulp horn, separated by a wide area of soft tissue (Fig. 6, above). The height of the buccal cap is 2 mm., that of the lingual cap, 0.5 mm. In a corresponding section through the distal cusps of the same molar (Fig. 6, below), there is only one small center of calcification, corresponding to the distobuccal cusp. The distolingual cusp has not yet begun to calcify. The lower first permanent molar of the other side of the same jaw was sectioned mesiodistally. In a section through the two buccal cusps (Fig. 7), conditions corresponding to those shown in the buccolingual sections were found: the mesiobuccal pulp horn has a calcified cap 2 mm. in height, the distobuccal cusp has just begun to calcify.

The actual distances between the centers of calcification of this tooth are: between mesiobuccal and mesiolingual cusps, 4.2 mm.; between distobuccal and distolingual cusps, 4.5 mm.; between mesiobuccal and distobuccal cusps, 4.2 mm. These figures come very close to the average figures of the corresponding distances in fully formed teeth. In fact, they are slightly larger than the corresponding figures in some normal, fully formed, but small lower first permanent molars of adults.

As far as the chronologic order of development of the various centers of calcification is concerned, my findings are fully in accord with those of Aoki,[35] who writes: "I was able to find that each cusp begins its calcification at different times, namely, the buccal cusps begin to calcify about a month prior to the lingual cusps. The mesial cusps begin to calcify earlier than the distal cusps. Hence in a tooth with several cusps the difference between the calcification of the mesiobuccal cusp and that of the distolingual cusp will be as long as even two months." (Fig. 5.)

After about 6 months of age, the individual centers of calcification have be-

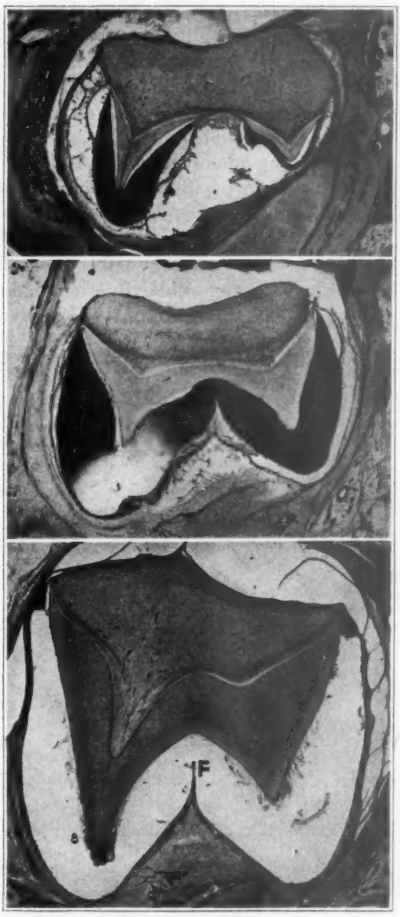


**Fig. 12.—Three successive stages in development of upper first bicuspid. Above: Stage 1. At 2 years, the buccal and the lingual cusps are about to become united. The presence of a marked tubercle of enamel on the buccal slope of the lingual (smaller) cusp is to be noted. Center: Stage 2. At 3 years, most of the enamel is in an immature stage, except for the tip of the buccal cusp, where the enamel had reached maturity and has been dissolved. The relative retardation of amelogenesis in between the two cusps is to be noted. Below: Stage 3. At 4½ years, the enamel is fully formed and matured except for a minute area near the cemento-enamel junction. A fine bladelike extension of soft tissue (*F*) indicates the position of the occlusal fissure. (×7.)**

come so wide at the base that they are united. This union first takes place along the marginal ridges of the occlusal surface, so that the calcified portion of the crown forms a ring with a center (area of the future central fossa) still uncalcified. Then the distobuccal and the mesiolingual cusps of the upper first permanent molar are fused by a ridge of enamel and dentin running across the occlusal surface and corresponding to the future oblique ridge (Fig. 8).

The age at which this fusion of the cusps into one solid occlusal surface takes place is given rather consistently by all those who have examined human first permanent molars during the first year of life. Röse's illustration of the upper and lower first permanent molars at 6 months has already been shown. He found the entire occlusal surface formed at the age of 10 months. The roentgenograms of Lambertz show the cusps ready to become fused at 8 months; those of Symington and Rankin show union at 9 months; those of Busin, Leist and Priesel, at 7 months, and those of Hess, Lewis and Roman, at about 9 months.

The histologic examination of the first molars of a child of 6 months revealed fusion of the cusps by a very delicate layer of dentin and enamel. The only gap in the calcification of the occlusal surface was found in the center of the occlusal grooves in the lower molars and at the bottom of the mesial and distal groove in the upper molars (Fig. 8 and Logan and Kronfeld,[41] Figs. 14 and 22). I found the occlusal surface fully closed at the age of 9 months, although the enamel and dentin were still very thin near the

41. Footnote 1, fourth reference.

bottom of the grooves (Fig. 9, above).

The deposition of enamel and dentin proceeds rapidly throughout the second year of life. Between 15 and 18 months, the enamel reaches its ultimate thickness at the tips of the cusps, while the ameloblasts are still functioning near the occlusal grooves and in the direction of the cemento-enamel junction. At 2 years, the process of enamel formation has reached the cemento-enamel junction, and at from 3 to 3½ years, the crown is fully formed and the root beginning to develop. The tissue changes leading to the formation

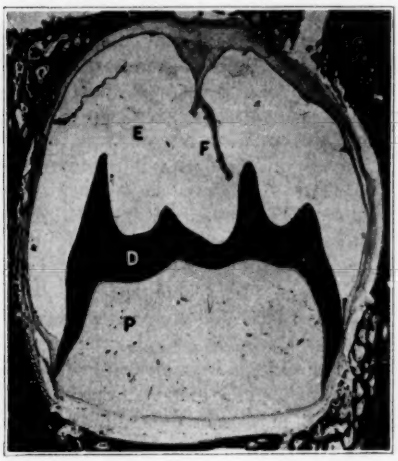


Fig. 13.—Buccolingual section through germ of lower permanent molar of pig. The extent of a very deep occlusal fissure is indicated by a long thin extension of soft tissue (*F*) between the buccal and lingual ridge of enamel. *P*, pulp; *D*, dentin; *E*, enamel. (×5.)

of the fissures will be discussed later in this paper.

In the interpretation of the specimens with developing tooth germs, the investigations and findings of von Ebner,[42] Beust,[40] Chase[43] and Kitchin[44] were of great assistance. These authors have shown that the enamel, subsequent to its deposition, undergoes maturation. The newly deposited enamel is acid-fast, stains dark blue or purple with hematoxylin, and, according to von Ebner, is optically a positive birefringent. This has been called immature enamel. After a certain length of time, it changes its physical properties, becoming optically neutral and, at least partly, soluble in acids. This enamel is called transitional. Finally,

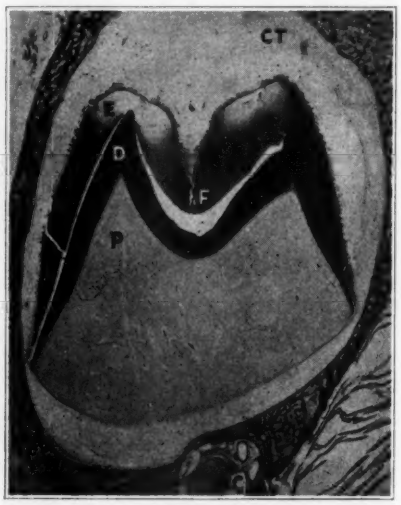


Fig. 14.—Buccolingual section through germ of a lower second permanent molar of baboon. *F*, very deep longitudinal fissure extending close to dentino-enamel junction; *P*, pulp; *D*, dentin; *E*, enamel; *CT*, connective tissue; *MC*, mandibular canal. (×8.)

when the enamel has reached maturity, it is completely dissolvable in acids. In this stage, it is optically a negative birefringent and is called mature enamel.

42. V. Ebner, V.: Arch. f. mikr. Anat., 67:18, 1906.

43. Chase, S. W.: Nature of Enamel Matrix at Different Ages, J.A.D.A., to be published.

44. Kitchin, P. C.: J. D. Res., 13:25 (Feb.) 1933.

In examining decalcified sections through developing teeth, we find one of the following conditions: Either all of the enamel is preserved; part of it is present and part of it has been dissolved, or all of it has been dissolved. In the first instance, if all of the enamel is still present after decalcification (Fig. 12, above), we can assume that it was of the immature or perhaps partly of the transitional type, but certainly not yet mature, although the outline of the crown may already have been fully formed. If the enamel is missing near the tip of the cusps but is preserved in the lower portions of the crown (Fig. 12, center), we know that the oldest enamel at the cusps has already reached maturity, while the younger, more reecntly formed enamel near the cemento-enamel junction was still immature. If, finally, there is no enamel in the area of the crown (Fig. 12, below), all the enamel was fully matured.

Chase[43] showed that it normally takes three months for human enamel to mature. Hence, it might be concluded that any undissolved portions of enamel in our specimens are less than 3 months old. Since this process of enamel maturation can be considerably delayed in case of disturbances of calcification, it is quite

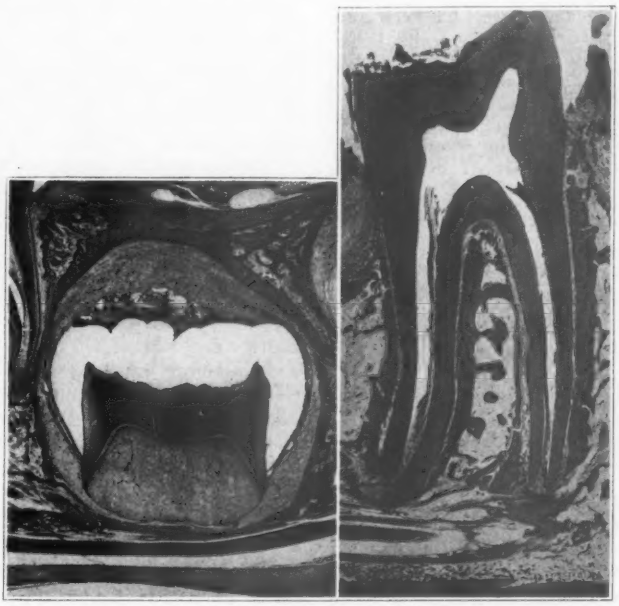

Fig. 15.—Lower first permanent molar at 3 years and at 8 years. Left: At 3 years. The crown is fully formed and the development of the root has just begun. The germ is located 1.5 mm. above the mandibular canal. The total height of the germ is 9.5 mm. Right: At 8 years. The tooth is erupted, and the root fully formed. The distance between the root end and the mandibular canal is still 1.5 mm., and the total height of the tooth (thickness of enamel estimated) is 22 mm. (×3.5.)

possible to find enamel in an immature stage even years after its deposition.

If we apply this knowledge to the analysis of any given specimen; for instance, to the upper first permanent molar at the age of 1½ years (Fig. 9, below), we arrive at the following conclusion: At this age, the outline of the occlusal surface is fully formed and the periphery of the crown extends rootwise just to the cemento-enamel junction. Ameloblasts are present only in the cervical one-third of the crown. The enamel has been completely dissolved from the occlusal surface; but, in the cervical third, the superficial, youngest layers of enamel are still present and stain dark purple with hematoxylin. Therefore, the enamel of this tooth can be classified as follows: enamel of occlusal surface, fully matured; enamel of cervical third, still immature or transitional.

At 2 years, there is very little undissolved enamel near the cemento-enamel junction, and at between 3 and 4 years, all of it has become mature and acid-soluble.

From these data, one may draw the practical conclusion that the enamel of the first permanent molars has reached its final and permanent condition at the age of from 3 to 4 years. After this time, it can no longer be influenced by disease, nor is it accessible to medication or other influences. If it is normally formed and calcified at 3 years, it will be so when the tooth erupts three or four years later. If it is poorly formed and imperfectly calcified, this will be its condition at the time of eruption.

In summarizing the findings described in this part of the paper, the development of the first permanent molar may be divided into the following five phases:

1. Prenatal phase (fifth fetal month to birth): Differentiation of the tooth germ; growth of enamel organ and dental papilla; modeling of the pulp and arrangement of the pulp horns corresponding to the later centers of calcification in the cusps.

2. Birth to 6 months: Formation of four or five centers of calcification, beginning about the time of birth with the buccomesial cusp and ending about two months later with the distolingual cusp; fusion of the individual cusps at about 6 to 8 months.

3. Six months to 1 year: Formation and calcification of occlusal surface; enamel immature.

4. One year to 2 years: Formation and calcification of entire crown; maturation of enamel beginning at the cusps and progressing cervically.

5. Two years to 3½ years: Complete maturation of enamel; beginning formation of root.

### FORMATION OF THE OCCLUSAL FISSURES

It is a well-established fact that the highest incidence of caries is found in the fissures and pits of the posterior teeth, and, therefore, much attention has been given to the structure and significance of these fissures. We shall see how the formation of the fissures takes place in a human tooth and what conclusions can be derived from these findings.

Black[37] defines a fissure as "a fault in the surface of a tooth caused by the imperfect joining of the enamel of the different lobes." He adds: "Fissures occur along the lines of the developmental grooves." Thus, Black stigmatizes a fissure as something abnormal or pathologic, in contrast to developmental grooves, which he defines as "fine depressed lines in the enamel of a tooth which mark the junction of the lobes." Similar definitions are found in the chapter on "Terminology" in Hyatt's "Prophylactic Odontotomy."[38] This conception of fissures as defects or flaws due to faulty de-

velopment of the union between the individual centers of calcification is also given and extensively discussed by other authors.

Let us consider the tissue changes that lead to the development of the occlusal surface of a bicuspid or molar, noting especially the formation of the area of union between the cusps.

The first three illustrations show mesiodistal sections through the buccal cusps or lower first molars at the age of 9 months, 15 months, and 1½ years, respectively. At 9 months (Fig. 9, above), the mesiobuccal and distobuccal cusps are united at the bottom of the buccal groove by a thin layer of dentin and enamel. (The infant from whom this specimen was taken showed both clinically and microscopically marked evidence of rickets. Therefore, it can be assumed that the development of this first permanent molar is behind that of other specimens of like age.) Next to this line of union, there is a small mesial and distal elevation ($x$) caused by a thickening of the enamel and dentin on both sides of the deepest sulcus between the cusps. These two inconspicuous elevations are later on of great importance in the configuration of the occlusal surface. By their rapid growth, together with a retardation of the enamel formation between them, they form the narrow division between the cusps known as a fissure.

This can be seen in Figure 9, center, which was taken from a specimen of 15 months. The formation of the occlusal surface is rather far advanced. Most of the enamel, except for the tip of the buccomesial cusp, is still of the immature and transitional type, and has therefore remained unchanged by decalcification. Because of the progress in enamel deposition on the slopes of the cusps, the formerly shallow depression between the cusps has been transformed into a narrow cleft, a typical fissure.

At 1½ years (Fig. 9, below), the occlusal portion of the crown is completed. The enamel has reached maturity and has been dissolved in acid, except for a few remnants near the dentino-enamel junction and some of the last formed immature enamel at the cemento-enamel junction. The two small enamel tubercles which were shown in the 9-months specimen on either side of the buccal groove have now become two enamel lobes separated from each other by a thin band of soft tissue lying in the buccal fissure. Each one of these enamel tubercles is separated from the corresponding mesiobuccal and distobuccal cusp by a shallow fissure. Thus, three fissures are visible in this section.

Figure 10 shows the center of the occlusal surface of a lower first permanent molar in a somewhat earlier stage of development than the teeth illustrated in Figure 9, above. The mesiobuccal and distobuccal cusps are united by a very thin layer of dentin. The smooth and rounded surface of the dentino-enamel junction at its deepest points between the cusps can be plainly seen. The enamel is not yet continuous from one cusp to the other; which indicates that the cusps are first bridged by dentin and only later by enamel. On both sides of the lowest point, there is a marked elevation or tubercle ($x$), consisting of both enamel and dentin. These tubercles, by their rapid growth and thickening, form the occlusal fissures, as shown in Figure 9, center, and Figure 12, center.

From a comparison of these figures, it can be seen that the fissures result from a characteristic retardation of the enamel formation in one portion of the occlusal surface, that is, between the cusps, and from a very thick deposition of enamel on the inner slope of the cusps, next to this area of retardation (Fig. 11).

This can be seen still more plainly in

buccolingual sections through upper first bicuspids in different stages of development.

In an upper first bicuspid of an infant of 2 years (Fig. 12, above), the layer of enamel between the larger buccal and the smaller lingual calcified cap is about to unite. The layer of enamel on each cusp shows a very regular arrangement, being thickest at the tip and tapering gradually toward the base of the calcified portion. On the inner slope of the lingual cusp, there is a definite elevation of enamel and dentin close to the deepest point of the occlusal surface. This small irregularity in the otherwise smooth slope is the first evidence of a future massive development of enamel in this area, which produces the central fissure. It corresponds to the two small enamel tubercles shown in Figure 10 on either side of the developing buccal fissure of a molar.

If the upper first bicuspid is examined at 3 years (Fig. 12, center), the outline of the crown is found to have undergone marked changes. These changes have been brought about by the deposition of varying amounts of enamel in different areas of the crown surface. Relatively, the greatest increase in the thickness of the enamel has occurred on the lingual slope of the buccal cusp and on the buccal slope of the lingual cusp. In these areas, the thickness of enamel has grown from about 0.3 mm. at 2 years to about 1 mm. at 3 years; whereas, on the tips of the cusps, the thickness is only about double that at 2 years (0.9 mm. and 1.8 mm.). The thinnest enamel is in the center between the two cusps, where it is only 0.5 mm. thick. This area corresponds to the bottom of the future fissure.

At 4½ years (Fig. 12, below), the outline of the entire crown is formed. The thickness of the enamel between the cusps is 2 mm., or about the same as in the previous stage. The only areas wherein ameloblasts are still present are the slopes of the occlusal fissure and near the cemento-enamel junction. The thickness of the enamel at the bottom of the fissure is 0.6 mm.

Corresponding changes have been found in all permanent molars. In all instances, enamel formation first ceases near the center of the occlusal surface. Next, it is discontinued at the tip of the cusps, and finally on the slopes leading from the cusps to the bottom of the fissure, and at the cemento-enamel junction. These microscopic findings are in accordance with von Ebner's[22] polariscopic examination of buccolingual ground sections through bicuspids of 4 and 5 years, in which the youngest enamel was invariably found on the slopes of the occlusal fissure and in the cervical portion.

We cannot give a satisfactory explanation for this variation in the activity of the ameloblasts in different areas of the tooth surface. The suggestion of malnutrition or dietary disturbance as a cause of development of deep fissures has no justification. Why should only one small group of ameloblasts, namely those lying at the bottom of the groove between the cusps, be influenced by a dietary disturbance, while the remainder of them continue normally to form enamel?

It is surprising how few papers in dental literature actually deal with the development and origin of the occlusal fissures. Most writers confine themselves to a description and a general statement to the effect that fissures and pits are faulty formations or flaws in the enamel. Zsigmondy[45] (1903) studied the occlusal fissures of upper first bicuspids He examined ground sections through a large number of apparently clinically intact upper first bicuspids, and, to his surprise, found a definite fissure between the buccal

45. Zsigmondy, Otto: Vierteljahrsschr. f. Zahnheilk., 19:318, 1903.

and lingual cusp in more than 80 per cent of these teeth. These fissures extended close to the dentin, but there was no actual exposure of the dentin at the bottom of the fissure in noncarious teeth. Zsigmondy showed how the fissure results from a variation in the amount of enamel formed in various parts of the crown surface. His conclusions are confirmed by the histologic findings shown in Figure 12.

In studying Black's writings on fissures and pits, one is impressed with the extreme difficulty of drawing a sharp dividing line between a "normal" groove and an "abnormal" fissure. Black[37] writes: "Grooves along the lines of junction of the lobes of the teeth are normal. When these are of such depth as to merit the term 'fissures' they are abnormal." He continues, after a description of a number of perfectly intact, well formed teeth with very deep fissures and pits: "These pits occur in the occlusal surfaces of the teeth of all animals that are omnivorous in their diet and should not be regarded as abnormal in man."

In order to confirm this last sentence of Black's, I am reproducing a buccolingual section through the germ of an unerupted lower permanent molar of a pig (Fig. 13). The crown is completely formed, and the fully matured enamel has been completely dissolved by decalcification. A buccal and a lingual ridge of enamel run in a mesiodistal direction over the occlusal surface. They are separated from each other by a very deep and narrow fissure which extends through most of the enamel thickness. After dissolution of the enamel, the soft tissue occupying this fissure is left and appears as a septum projecting deeply into the crown. A similar condition is found in a buccolingual section through the unerupted lower second permanent molar of a monkey (baboon) (Fig. 14). In this tooth, the enamel was still in an immature stage, and, therefore, has for the most part been retained after decalcification. The longitudinal fissure is very deep, extending almost to the dentinoenamel junction.

At all times, fissures and pits have been found in normal human teeth, and from the frequency of their occurrence and the regularity with which, in perfectly normal human as well as in other mammalian molars and bicuspids, the ameloblasts cease to function in some areas and continue to deposit enamel in others, I am convinced that pits and fissures are just as much a normal structural characteristic of these teeth as are cusps or grooves. After all, if a structure or a form is found regularly in all human molars, from the Neanderthal jaw to all our present races, it can hardly be called a flaw or defect. Typical deep fissures are also normally found in the molars of the pig, monkey, white rat and other mammals, the teeth of which are similar to human molars.

One important point in this connection is the difficulty in deciding whether a tooth has a pit or fissure. The macroscopic or clinical examination does not give sufficient evidence, because many fissures are so fine that they cannot be recognized clinically. I have also noted a decided difference in the incidence of deep fissures, depending on whether ground sections or serial microtome sections were examined. Since it is impossible to prepare more than a few ground sections through each molar or bicuspid crown, it is possible to produce ground sections showing no fissures whatever, because an individual ground section may happen to run through an enamel ridge between the cusps instead of through a pit or fissure, and thus seemingly prove that no fissure is present.

If serial microtome sections through

crowns fully formed but unerupted are examined, there will always be, in some areas, thin blades of soft tissue (enamel epithelium and connective tissue) which extend between the enamel lobes; which indicates that typical fissures or pits would have been present had the tooth erupted (Figs. 9 and 12).

A fallacy frequently encountered in dental writing is the statement that the dentin may be exposed at the bottom of a fissure of an otherwise normally formed tooth. An examination of a large number of ground or decalcified sections through intact teeth will reveal that this is not the case. Zsigmondy's statement to this effect has already been quoted. Black says: "We occasionally find malformed teeth in which the pits and fissures have failed of closure and in which some area of dentin is actually exposed. This, however, is rare. Ordinarily all of the deeper pits have a fairly good layer of enamel covering the dentin." My own findings fully support Black's statement. In no instance have I seen dentin actually exposed at the bottom of a pit or fissure, except when the intervening layer of enamel had been destroyed by caries or in malformed hypoplastic teeth, in which the dentin may sometimes be found exposed in any area because of a congenital absence of enamel.

We come now to the most crucial point of the whole discussion; namely, the relation between fissures and dental caries. An interesting article in this connection is Bödecker's[46] report on the examination of the teeth of ancient American Indians. From a macroscopic and microscopic study of several hundred teeth from Pueblo Indians who lived 800 or 900 years ago, Bödecker comes to the conclusion that most of the young teeth of the ancient Indians contained fissures. He calls these fissures enamel defects. I rather doubt the justification of the term "defects" in this connection. The teeth illustrated in Figure 2 of Bödecker's paper are, in my opinion, perfect specimens of human teeth, and the fissures found in them certainly are not "serious enamel defects," since they were found in all teeth, and in no way interfered with the dental health of these people. The Indians whose teeth Bödecker studied had an exceedingly low incidence of caries.

I do not believe there is any justification for considering the fissures in human molars as "flaws," "faults" or "defects" merely because they are so commonly the site of dental caries in our civilized races. This has been very clearly expressed by Bödecker in the first part of his conclusions:

1. Enamel fissures or defects in the protective covering of the teeth were present to as great a degree as they are in the teeth of individuals of today.

2. Enamel defects did not, at the time, predispose these teeth to decay, as shown by the fact that the incidence of dental caries was exceedingly low.

In nearly every report dealing with the paleontology and anthropology of the teeth, illustrations are found which show the typical development of fissures in the human bicuspids and molars. In my opinion, these findings permit of only one conclusion; namely, that fissures always are and always have been present in all human bicuspids and molars. Are we, then, justified in calling fissures "defects"? Webster defines a defect as a "want or absence of something necessary for completeness or perfection; deficiency, imperfection." Calling a condition a "defect" or "imperfection" implies that it is not found in the great majority of cases. Is this applicable to the fissures of the human teeth? Is there such a thing as an "ideal" or "standard" tooth without fis-

46. Bödecker, C. F.: J. D. Res., 10:313 (June) 1930.

sures, that teeth with fissures may be considered deviations from this standard? This can be answered only with a distinct "No." A molar with its typical and characteristic fissures is a normal molar. A molar without fissures would be just as defective or abnormal as a molar without cusps or without a pulp chamber.

Bödecker[47] makes this statement: "Fissures are so frequent in the occlusal surfaces of molars that they may well be regarded as a common occurrence; yes, even a normal condition." I fully subscribe to this statement; moreover, in view of my findings in serial sections through human molars, I would modify it to this: "Fissures are always found in the occlusal surfaces of normal human and many other mammalian molars. They are, therefore, a normal condition."

Only since man has reached his present state of civilization and domestication have fissures shown a marked tendency to decay; therefore, early dental attention is highly desirable and indicated. But this is not the fault of the fissures. When we hear how the teeth of the Eskimo children are subject to rapid decay as soon as their parents move into the white man's town and assume the white man's living habits, we cannot blame the fissures for it. The molars of the Eskimos have always had fissures, as have all molars of both ancient and modern peoples; yet they were immune to caries until their environment and their way of living changed.

I fully agree with the postulate that until we know more about the cause and prevention of dental decay, prophylactic filling of the fissures is of paramount importance to the maintenance of dental health in the present-day civilized races. I cannot see how the comparatively recent high incidence of decay in the fissures which are a part of our normal human tooth forms can be taken as evidence that these fissures are faults or defects.

47. Bödecker, C. F.: D. Items Int., 48:161 (March) 1926.

## TOPOGRAPHY OF THE FIRST PERMANENT MOLAR FROM BIRTH TO THE AGE OF 15 YEARS

One of the most interesting phases in the study of serial sections through human jaws of different ages is the study of the growth changes in the teeth. I have made measurements of the lower first permanent molar and shall report briefly on the findings.

In a cross-section through the mandible in the area of the first permanent molar, there are two definite landmarks that can be used to measure the topographic relationship between jaw and tooth: the mandibular canal and the lower border of the mandible. With these landmarks, the following measurements of the development of the mandibular first permanent molar were made: (1) the distance between the lower border of the mandible and the center of the mandibular canal; (2) the distance between the center of the mandibular canal and the lowest point of the tooth germ or root (Hertwig's sheath or apex); the distance between the lowest and the highest point of the tooth germ or tooth (height of tooth germ or tooth).

The results of these measurements can be summarized as follows: The distance between the lower border of the mandible and the mandibular canal increases between birth and 15 years from 2.5 mm. to 7.5 mm.

The distance between the mandibular canal and the lowest point of the first permanent molar shows but relatively little variation during this time, increasing from 1 to 2 mm.

The height of the germ increases rather slowly and constantly during the

first three years of life, while the centers of calcification are formed and united and the crown gradually becomes higher. Between the third and fifth years, there is a very rapid increase in the height of the tooth germ, caused by the formation of the major portion of the root. From then on, the root again forms more slowly, until the entire tooth is completed.

The most significant result is that the distance between the lowest point of the tooth germ and the mandibular canal remains practically stationary. At 15 years, it is hardly twice as much (2 mm.) as at birth (1 mm.) in comparison to an increase in the total height of the tooth from 5 to about 21 mm. This is additional proof of the incorrectness of the old conception "that the forming root grows into the jaw." It shows the correctness of Orban's[48] statement that Hertwig's sheath is the relatively fixed point in tooth development, and that the entire growth of both crown and root takes place in an occlusal direction, out of the jaw.

Orban's measurements were made on the germs of upper deciduous and permanent central incisors. In both deciduous and permanent teeth, the distance between the upper end of the tooth germ and the floor of the nose increased slowly and steadily. During this time, the height of the tooth increased orally. There was no evidence of an active displacement of Hertwig's sheath into the jaw, but rather it remained relatively stationary, and the development of the tooth took place in an occlusal direction.

Bustin, Leist and Priesel[33] found a similar condition roentgenographically in the study of the lower deciduous and permanent molars. They state that the distance between the lowest point of the molars and the mandibular canal does not change to any marked extent, but that this distance remains rather constant, and the entire growth of the tooth takes place occlusally.

My measurements of histologic sections through the mandible fully confirm the findings of Orban and Bustin, Leist and Priesel. As the jaw grows in the vertical dimension, the distance between its lower border and the mandibular canal is markedly increased, as is also the height of the jaw above the canal and the height of the germ. The distance between the mandibular canal and the lowest point of the germ of the first permanent molar remains almost constant.

Figure 15 shows a comparison of buccolingual sections through the mandible of 3 and 8 years in the plane of the mesial cusps of the lower first molar. At 3 years, the formation of the crown is just completed. At 8 years, the root is almost fully formed. In both cases, the distance between the center of the mandibular canal and the lowest point of the tooth is 1.5 mm. The other dimensions of these two specimens are given in the text of Figure 15.

## SUMMARY

1. The data on the onset of calcification of the first permanent molar found in dental literature from the time of John Hunter to the most recent publications show little consistency, varying from the sixth fetal month to the sixth postnatal month. Since a more definite knowledge of the various developmental phases of this tooth is obviously of great interest and importance, a roentgenographic and histologic study of this question was carried out on twenty-six human jaw specimens of different ages.

2. The roentgenographic examination of some specimens of new-born children revealed a complete absence of calcifica-

48. Orban, Balint: Growth and Movement of Tooth Germs and Teeth, J.A.D.A., 15:1004 (June) 1928.

tion of the first permanent molar. In others, one center of calcification, corresponding to the mesiobuccal cusp, was visible.

These roentgenographic findings were fully corroborated by the histologic examination of the same specimens. In many cases, the first permanent molar at birth and during the first month of life consisted only of a soft mass of enamel organ and pulp. In some specimens, a minute cap of enamel and dentin was found on the tip of the mesiobuccal pulp horn.

3. The centers of calcification in the first permanent molar appear in the following chronologic order: mesiobuccal cusp, distobuccal and mesiolingual cusp and distolingual cusp. The last may begin to calcify as much as two months later than the mesiobuccal cusp.

At about the third month after birth, four or five separate centers of calcification are present on each molar crown. These centers already occupy their definite relative arrangement. There is no indication of any change in position or of any active moving apart subsequent to the onset of calcification, as described and illustrated in drawings by some dental authorities.

At about 6 or 7 months, the individual cusps begin to unite at the occlusal fissures. At from 1½ to 2 years, the outline of the crown is completely formed, but some of the enamel is still in the young or transitional stage. At 3½ years, the crown can usually be expected to be fully formed and calcified.

4. The occlusal fissures in the human as well as other mammalian molars and bicuspids are normal structural characteristics of these teeth. They result from an early retardation of amelogenesis in predetermined areas between the cusps, and from a relatively pronounced development of enamel in the immediate periphery of these areas. There is no justification for the common assumption that fissures are defects or faulty formation, since fissures occur regularly and normally in perfectly formed molars and bicuspids, in prehistoric men and in recent primitive as well as civilized races. The high incidence of caries in the fissures of modern man cannot be taken as proof that fissures are "defects."

5. The postnatal growth changes in the first permanent molar conform with the vertical growth of the jaws. From birth to the age of 15 years, the lowest point of the lower first permanent molar lies about 1.5 mm. above the mandibular canal. The height of the tooth germ increases during this time from about 5 mm. at birth to about 22 mm. at 15 years, and the distance between the mandibular canal and the lower border of the mandible from 2.5 to 7.5 mm.; but the distance between the mandibular canal and the tooth remains fairly constant during this time. This shows that, in the growth of the tooth, Hertwig's sheath is the relatively fixed point.

# BALANCED AND FUNCTIONAL OCCLUSION IN RELATION TO DENTURE WORK*

By F. S. MEYER, D.D.S., Minneapolis, Minn.

FOR the past twenty-five years, there has not been a meeting of any great importance where balanced and functional occlusion has not been discussed. But because there were so few scientific facts known to draw from in forming our opinions, it has been easy for a good talker to introduce any technic which seemed plausible. Most of these technics added something of value to the sum total of dental knowledge, but all failed to produce the desired results in a great majority of cases.

Functional occlusion is the very foundation upon which the comfort of the patient, the efficiency of the restoration and the service of the work depend. I place comfort first because the teeth are seen only a little part of the time. They are used in mastication only at meal times, but they are in the mouth all the time, if they are comfortable. Otherwise, they are very often worn in the pocket, if they are dentures. I am reminded of a statement by a prominent dentist that comfort for the patient was not of prime importance; that we should seek, first of all, correction of deformities; that we should seek to bring the mandible back to its normal position (and on what that normal position is, there are probably as many opinions as there are dentists). In bringing this up, I in no way wish to belittle the great work done by the late Dr. Monson, for undoubtedly there are some cases that call for just that treatment, if properly given, but when argued by a man who knows absolutely nothing about the theories of occlusion, the whole thing becomes ridiculous. The same man stated that all first restorations should be regarded as treatments, and that comfort to the patient was not to be expected for the first three or four years. A nice alibi to give the patient when he is not able to masticate with comfort!

We have all had too many alibis in the past, when full dentures loosened through lack of balance and function, when partial dentures loosened and ripped the anchor teeth loose and when bridge abutment teeth were sore and often lost their vitality from tension and malocclusion. When it becomes known to the laity that these conditions can in a large measure be avoided, it will be much harder for us to frame alibis.

In the past, the profession could not be blamed for all these conditions, for the men who have been in practice over a long period of years have tried most of the so-called modern adjustable articulators and, for one reason or another, have discarded them one by one. I believe that the plain line was the first; but only centric occlusion was sought. Then came the adjustable articulators, and much was claimed for each in its turn. In fact, we often thought that we were getting somewhere with each new

*Read before the Section on Histology, Physiology, Pathology, Bacteriology and Chemistry (Research) at the Seventy-Sixth Annual Session of the American Dental Association, St. Paul, Minn., Aug. 9, 1934.

one, only to meet with disappointment. All fail somewhere, in most hands. The late Dr. Monson probably came nearer than any one else to establishing scientifically the position of each tooth in the arch. Many of his theories were correct and were substantiated by fact. But the unavoidable errors in the technic and the numerous variations from the theoretical normal too often marred the final results. I base this statement not altogether on personal experience with the Monson articulator, but on my observation of the final results from men following the Monson theories, men who were thoroughly familiar with the Monson theories and whose technical skill was far superior to mine. I also base my statements on the findings of skilful operators who were thoroughly familiar with the Monson theories but who had met with too many failures in following them to continue; men who recognized the discrepancies but could not overcome them. Lastly, I base my statements on my own findings in developing this technic.

The last of the technics of which I wish to speak is that of Dr. Stansbery. He had excellent results. He also deserves a great deal of credit. Unfortunately, there are few men who are able to follow him and obtain equally good results. And there are also other features of his technic which seem to forbid its general adoption.

But all those men who have sought the last word in balanced and functional occlusion have always insisted on a final milling in on the articulator (and have even invented a machine for doing so) before considering the case finished. Why? Because they recognized the discrepancies in technic. This milling in could correct only slight discrepancies. If the occlusal curves were wrong, milling in either on the articulator or in the mouth would not be of any help in establishing an accurate function and balance. The same holds true of relining. How absurd it would be to think that we could change the occlusal curves by relining.

In the final analysis, most patients masticate with the dentures only in centric relation because that is the only position in which they are comfortable. Something has been vitally wrong with this problem. However, better dentures could be built with any articulator, if the profession as a whole were more familiar with the theories of occlusion and certain fundamentals.

Having chosen the articulator to be used, there are certain fundamentals that apply equally well to all technics, such as vertical dimensions, facial expression and the contour of the teeth. While there are rules to follow in complying with these fundamentals, there is a certain amount of the personal equation in all cases. There are other fundamentals which require less consideration of the personal equation, but which are absolutely necessary with all technics of any value except that of Dr. Stansbery; for instance, gothic arch tracing and facebow transferring.

It is indeed unfortunate that so few men realize the true value of the gothic arch tracer and the facebow transfer. Without them, practically everything has been guesswork up to this time.

Let us stop for a moment and see what these two steps really do for us. Imagine the two casts rotated slightly to the left on the articulator. That fact cannot always be detected by looking at them. In such a case, if we should chance to open the bite a trifle, we would open it more on the right side than on the left because the right side would be farther from the condyle than the left. That discrepancy may be discovered when we insert the trial plates. But if we choose to close the

bite, we close it more on the right side than on the left. Other discrepancies, such as the opening up of the occlusion at one point more than at another in the lateral excursions of the mandible, would also show up when the cases were transferred from the articulator to the mouth. If the casts are not the right distance from the condyles, the relative amount of opening of the posterior teeth to that of the anterior changes when the cases are transferred from the articulator to the mouth. If the posterior teeth are set too high or too low in relation to the anterior, true balanced occlusion is a geometric impossibility on a modern articulator without readjustment of the condylar path to conform. Unfortunately, that cannot be done in the mouth. Here, the condylar paths are established by nature and we must build our dentures so that the functional occlusal path conforms to them. Even if the casts are transferred to the articulator in their proper relation to one another and to the condyles, balanced occlusion cannot be assured unless we have the correct occlusal path in its correct relation to the condyles. Even then, the condylar path of the articulator must duplicate that of the patient. That would, of course, be a remote accident. Recalling our struggle to get a balance that we were satisfied with even on the articulator, we can readily see that we were really up against a stone wall and did not know it. It is absolutely impossible to tell by looking at the casts whether they are rotated to the right or to the left, whether they are too low on the right side or on the left, whether they are too low in the anterior or posterior region, or whether they are the correct distance from the condyles. That being the case, if the gothic arch tracer or the facebow transfer has not been used, balanced and functional occlusion has been a remote accident. And often when we might have thought that we had an accurate balance, we were deceived by the "give" in the tissues of the mouth, which covered up the discrepancies.

But if these two instruments have been used and we are sure of the transfer, what technic has ever taught us how high to place the lower first molar in relation to the central incisors and the condyles? None. True, Dr. Monson gave us an arbitrary path, but that did not meet conditions in all cases.

I need not go any farther to convince you that all restorative work up to this time has been pure guesswork with most of us; and very poor guesswork with some. In my thirty-two years of practice, I built the first bridgework wherein I accurately determined the position of every cusp on an articulator to obtain accurate functional occlusion less than four years ago.

I saw the first case of accurate balance (such that every opposing cusp touched with equal pressure in every position of the mandible) that I had ever seen in denture work less than four years ago, a case of full upper and lower dentures built on a 25 cent crown articulator. The theory of that technic I expect to discuss today.

At the 1920 Session of the American Dental Association, in Boston, Dr. Gysi made two statements which now show plainly how far he was ahead of his time: "The longer we study the movements of the mandible, the more shall we be astonished at their infinite variety." Nothing could be truer. Again quoting: "The problem of articulation will not be solved until the mandibular movements can be exactly imitated, not only for the average case but for all cases." In terms of adjustable articulators, that statement is also true. But if it can be shown that a set of dentures can be built with the

correct occlusal curves in their proper relation to the condyles in any individual case without the use of an adjustable articulator, that is approaching the subject from an entirely different angle. The technic for building full dentures to function and balance appeared in the February, 1934, issue of THE JOURNAL.[1]

To get the most comfortable and the most accurate functional occlusion in dental restorations, we must so arrange the teeth that they meet the opposing teeth in the greatest number of positions of the mandible, with no interference at any point and with equal pressure at all points. We must so arrange them that they meet the path that the opposing teeth travel in; that is, meet the path that the occlusal surfaces of the opposing teeth travel in. This sounds difficult, but it is not. In full mouth reconstruction cases or in edentulous mouths, there are no opposing teeth to direct the path. Hence, we must seek to establish one that will meet the demands of all the mandibular movements. Here, we leave the domains of guesswork and enter the domains of scientific accuracy.

If it were possible, as I thought it would be, to build a full upper and lower set of dentures to accurate balanced and functional occlusion, there must be a path, an imaginary path if you please, somewhere between the upper and lower arches, at given vertical dimensions, at a given length of upper and lower teeth, which every cusp must make contact with in the various movements of the mandible. That being the case, if we could only locate that elusive path and register it in stone or plaster-of-Paris, all that we should have to do to build a case in balance would be to grind the teeth to this path, and the upper and lower teeth would make contact with one another in the various movements of the mandible. That is the technic. Could anything be more simple? As this technic has been published in some detail, I shall attempt to be as brief as possible.

For the purpose of convenience, full dentures may be divided into two groups; namely, those built to an end-to-end bite with a single uniform occlusal curve, and those built to a large overjet and overbite with a compound occlusal curve. Each of these groups may be subdivided into two; namely, those with flattened cusps and those with normal cusps of varying heights. The first subdivision of the first group I discussed in some detail in my last paper.

The second subdivision of the first group calls for normal cusps and gives the best esthetic effect when conditions will permit its use. The procedure is the same as for end-to-end bites with flattened cusps, up to the time of making the final stone paths. I shall describe this procedure briefly. Trial plates are made in the usual way, giving us the vertical dimensions of the upper and lower as well as the contour of the anterior teeth. These trial plates are then laid aside for future reference but no bite is taken. Two more sets of baseplates are constructed. These are fitted as accurately as possible with the plate line properly outlined. The upper cast is prepared for postdamming and the proper thickness of tinfoil relief is inserted. The baseplates are then refitted. This procedure will produce the best possible suction for the upper trial plate. These baseplates are built up with compound rims about twice the usual width and short of the desired height (as indicated by the original trial plates) by 2 mm. The rims of one set of baseplates are covered with two thicknesses of pink carding wax and a rim of

1. Meyer, F. S.: New, Simple and Accurate Technic for Obtaining Balanced and Functional Occlusion, J.A.D.A., 21:195 (Feb.) 1934.

No. 0.60 tinfoil, and vaseline is applied. These trial plates, or wax paths as I shall call them from now on, are inserted in the patient's mouth. They will probably touch in the posterior region first. The patient is directed to go through the mandibular movements with the wax paths touching under biting stress or pressure.

In a few minutes, the true functional path will begin to appear on the rims. I shall not repeat here the technic for checking these paths for accuracy; but when these wax paths remain in contact with every movement of the mandible, they are tied together with wire staples and transferred to a plain line articulator by means of a gothic arch tracer and a facebow transfer. With this technic, it is possible to get an accurate result without the use of the tracer or the facebow. If we should choose to open or close the bite a trifle after the transfer, there might be a discrepancy. If the bite were taken and transfer made with the mandible to right or left, dentures in accurate balance and function could still be built without altering the relation of the casts to one another on the articulator. Without the gothic arch tracer, we cannot be sure of the accuracy of the facebow transfer. For that reason, I developed a combination of the two. On the facebow transfer arm inserted into the lower wax path, I soldered a flat piece of metal. When this is covered with a thin layer of carding wax, it produces an excellent medium for the needle of the tracer to register in.

When the transfer has been made, we may discover certain discrepancies. The vertical dimensions may be wrong; or the path may be a little higher on one side than on the other.

The second set of baseplate rims are built up in compound so that each one is short of the desired height by about 1 mm. The articulator is so set for each one as to allow 1 mm. of space between the wax path and the opposing compound rim. This is then filled with plaster of Paris. We have now an upper and a lower trial plate with a plaster rim approximating closely in height and occlusal curve what is desired. We call these the trial plaster paths. The wax rims are removed from the wax paths and the underlying compound is built up to within 2 mm. of the desired height, conforming to the occlusal curve on the plaster paths. If, at this stage, the compound rims should appear to be at different heights above the lower cast on the two sides, correction is made for bringing them to a level. These compound rims are again built up in pink carding wax and tinfoil, and vaseline is applied. At this stage, the wax paths are close to the desired height and curve. Therefore, the desired true curve is quickly generated. The plaster is now removed from the trial lower plaster path. This is covered with a mix of stone and the articulator is closed to the desired vertical dimension. When hard, the wax path is removed and the faulty edges of the stone path are trimmed away. The original upper trial plate, giving contour and vertical dimension, is placed on the cast opposite the stone path. The wax rim is trimmed away from the posterior aspect of the trial plate until the anterior rim rests on the stone path. The outline of the anterior contour of the trial plate is marked with a pencil on the stone path. The articulator is set for a bite opening about 1 mm. greater than that of the trial plate. Up to this stage, the procedure is the same as for flattened cusps.

The glaze and the sharp points are removed from the occlusal surface of the upper posterior teeth and the grooves and the fissures are emphasized. The six anterior teeth are ground and set up to the outline on the stone path. The posterior teeth are then set up so that they bear

the correct relation to the lower ridges, with all cusps touching the stone path. It will be found that as each porcelain tooth is set in the wax, it shrinks back and shortens a trifle, accordingly as the wax cools. Therefore, when all the teeth are set up, some will come closer to touching the stone path than others. Here, the extra vertical dimension obtained by opening the articulator a trifle is appreciated. The wax is softened under all the teeth, and the articulator gently closed to a bite opening just a trifle greater than that desired for the finished case. When the wax has cooled to room temperature, final corrections are made by grinding the spots that happen to be a trifle high. This will allow all cusps and incisal edges to touch the stone path at the desired vertical dimension.

To check for esthetics, the lower teeth are set to their correct vertical dimension and in correct relation to the upper teeth. Grinding is not done at this time. If the esthetic values are correct, the upper denture is completed in the material of choice. This done, we are ready to generate the path for the lower denture. The wax is removed from the lower wax path and a rim is built up in green or black compound 2 mm. above the desired vertical dimension. A little time might be saved if this were done before completion of the upper denture, for we then have the correct curve to build the compound to. If the upper teeth are set in hard wax, it is possible to generate the path for the lower without vulcanizing or pressing first.

The surface of the compound rim is softened and quickly replaced in the patient's mouth, and he is asked to close in centric relation. This will leave the imprints of the upper teeth in the compound. The same technic is used in building an artificial denture opposing a natural denture. It gives a result accurate to the point of being uncanny. No tooth will ever have to be touched for occlusion when the denture is placed in the mouth. It makes perfect simplicity out of one of the most puzzling problems that we are ever confronted with; namely, building a full denture opposing natural teeth so that it will function accurately. All compound is cut away from the occlusal surface except the ridges produced by the fissures and interproximating surfaces of the upper teeth. After resoftening, the patient is asked to close again. Repeating this process several times equalizes the pressure, and it is repeated until the patient closes the same each time and the correct vertical dimensions are reached. It is very important that the patient close in centric or, better still, rest position.

When we are sure that the patient has closed in rest position and at the correct vertical dimensions, all the compound is again cut away except a narrow ridge entering the grooves, fissures and interproximal spaces, and replaced in the mouth. We then ask the patient to make the lateral excursions, as well as the protrusive movements. If, in the lateral excursions, the compound ridges maintain contact in the molar region and not in the bicuspid region, the cusps are too high or the grooves too deep in proportion to those in the bicuspid region. We may deepen the grooves and pits in the bicuspids of the upper teeth until contact is maintained with every cusp in the lateral excursions; which will permit of a trifle greater overbite; or you may have the patient make the lateral excursions until the compound ridges in the molar region are cut down in height, contact thus being allowed with every cusp both in right and left lateral positions. This keeps the overbite where we had it. If every cusp touches this compound ridge in the various excursions, the same will be true

when the teeth are built to the path generated with these ridges covered with carding wax, and the upper teeth.

We are now ready to generate the wax path. The lower compound bite rim is covered with carding wax to the depth of the ridge and placed in the mouth and the patient is instructed to close in centric relation. He is asked to repeat this several times until the compound ridges show through the pink wax and then asked to move slightly to the left and the right. We have him repeat this slowly, each time making a longer excursion and we see that the upper teeth are constantly kept moist with saliva so that no wax sticks to them. The patient is requested to make the various protrusive movements as well. If there should be a break in the wax, we dry the surface, fill in with more wax and repeat the process, and we see that the path generated by the upper teeth shows definitely.

We then have a lower denture in accurate balance with the upper denture, except that the occlusal of the lower is wax. The lower wax path is mounted on the cast on the articulator and the upper cast is inserted in the wax and mounted. This step may be eliminated if the teeth are to be tried in the mouth before vulcanizing or pressing. The upper frame is removed with the upper denture mounted. A new frame is inserted and the counterpart of the wax path poured in stone. The screws are set for the correct bite opening and the lower wax path is separated from the stone path. The stone path is removed from the articulator and the upper denture replaced. The lower teeth are set, if this is not already done, to the upper without any grinding. Now, the upper denture is removed and replaced with the upper stone path. The occlusal surfaces of the lower teeth are ground until they fit surface to surface with the upper plaster path, maintaining their relation to one another buccolingually and anteroposteriorly. Here also, it is well to leave the bite a trifle too high while setting up the teeth. After softening the wax a trifle, we close the articulator to the correct bite opening.

When these dentures are placed in the mouth, they will balance and function accurately. No adjustments will ever be necessary. The lower teeth are built to the path that the upper teeth travel in the various movements of the mandible and therefore they cannot interfere with them. This is the ideal type of case. It will produce functional comfort, balance and the best esthetic values.

The next group to be discussed is that in which the esthetic values call for a large overjet and an overbite. If, in the natural dentition, the patient had a large overjet and an overbite, it is not advisable to build a set of dentures to an end-to-end bite. Esthetics and comfort to the patient will not permit it. If the patient should happen to have a long upper lip, in many cases it would be necessary to open the bite too much in order to build to an end-to-end bite. Both the esthetic values and comfort to the patient would be lost.

This type of case calls for a definite compound occlusal curve, which is unknown, as far as I am aware, to the profession today. It is generated by each individual.

Trial plates are made as in the end-to-end bite cases, giving the contour of the anterior teeth as well as their vertical dimensions. The wax paths may be started as in the end-to-end bite cases. When the trial wax path has been generated, a triangular piece of the rim is cut away from the posterior end of the upper wax path and correspondingly built up on the lower. In the anterior region, it is cut from the lower and built down on the

upper. With the wax and tinfoil replaced, the path is generated from this point.

In many cases, this brings the posterior part of the path too close to the upper ridge. In such cases, the approximate path is built in compound from our knowledge of the curve desired. This is done short of the vertical dimensions desired. The trial paths are placed in the mouth, and compound is added or removed from the upper or lower denture until they touch surface to surface in centric and anteriorly and posteriorly in protrusive relation. These compound ridges should be built back as far as the teeth will go and no farther. In the anterior region, the highest point of the compound ridge should be over the ridge of the cast. From this point, the compound ridge should slant down gradually toward the posterior and abruptly toward the anterior region. The more abrupt this is, the greater may be the overbite in proportion to the overjet and still have balance. These compound paths are built up with pink carding wax and tinfoil, as above described. They are covered with vaseline and the paths are generated. They should maintain contact from the median line back on one side and in the posterior region on the other in the lateral excursions; also in the anterior and posterior region in protrusion.

The patient should be requested to go through all possible mandibular excursions within the range of mastication. These wax paths are transferred to a plain line articulator as in the case of end-to-end bites. Stone paths are poured as before described. These stone paths show some very characteristic curves. For instance, in the molar region, there may be a normal lateral curve. In the second bicuspid region, there may not be any lateral curve at all. In the first bicuspid region, there probably will be a reverse lateral curve increasing anteriorly. Anteroposteriorly, there will be a compound curve approaching the letter s in shape. When the teeth are set up, these curves are reproduced on the occlusal surfaces. The greater the overbite in proportion to the overjet, the farther posteriorly will occur the reverse lateral curve.

Last spring, I had occasion to build a lower bridge from the first molar to the first bicuspid. The occlusal path was generated in the usual way. I paid little attention to the occlusal surface while waxing up the bridge. When the bridge was finished, I noticed that the distobuccal cusp of the lower molar was higher than the distolingual, while the mesiobuccal cusp was lower than the mesiolingual. On examination of the natural teeth on the opposite side, I discovered the identical condition, which had existed from the time of eruption. That would tend to prove that large overbites are probably normal to some persons.

The teeth in a general way are set up just as in the case of end-to-end bites. A little more care may be necessary on account of the complicated curve that the occlusal surfaces have to meet. If normal cusps are used, the upper is made first, as in the case of end-to-end bites. The path for the lower is also generated, as before described.

With this group of cases, balance is maintained with every excursion of the mandible, including the lateral protrusive. If the last lower molars are tipped up to take care of the overjet and overbite, as is done by the present technics, and the molars are in contact in centric, that is the only place where the teeth may touch in the act of protrusion until the anterior teeth meet. This causes a lack of balance for a part of the time. And if there is overjet without overbite, there will be an opening between the anterior teeth in protrusion. With partial upper

and lower dentures, the technic differs somewhat, but the same principle is carried out.

While I have taken up only full denture construction, I want to say in conclusion that this technic applies equally well to all types of bridgework or denture work whether we have high cusps, low cusps or no cusps at all; whether we have an end-to-end bite or a large overbite, or are building partial or full restorations in one arch or both.

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# FURTHER STUDIES OF THE EFFECT OF VARIATIONS IN MANIPULATION ON DIMENSIONAL CHANGES AND FLOW OF AMALGAMS*

By MARCUS L. WARD, D.D.Sc., and ERMAN O. SCOTT, M.S., Ann Arbor, Mich.

PRELIMINARY reports of this study were made to the association at its meeting held in March, 1931, and were published in June of the same year. The full report was published in THE JOURNAL.[1] From the number of letters received from many states and several foreign countries, it appears that there is a renewed interest in this subject, which rivals closely that of former days, when the supposedly toxic effect of mercury from amalgam fillings was a subject for spirited controversies. The interest shown now, while manifestly not always supported by a knowledge of nor interest in metallurgy, is, in many respects, wholesome and encouraging.

It has, indeed, been very interesting to observe the attention that is being given to details of experimental work by those who formerly were known to be interested primarily in the details of clinical applications. Equally interesting has been the response of the manufacturers, who have, during the last few years, had associated with them some of the best scientists who could be employed, and who, by training and habit, were interested in the minutiae of the previous report.

Among the questions raised by several persons who had studied the previous report was: What takes place when a mass of mixed and mulled alloy and mercury is allowed to lie untouched for some time before packing? These persons had observed our previous work showing that the mercury removed from a setting mass was not always proportional to pressure, there apparently being a place in the rising pressures we had applied where the mercury was in combination to such an extent that it was not easily removed. Some had observed that if mercury were not removed during the mulling process, more mercury would be retained in the set mass of amalgam. Others had observed our references to the ratio of mercury to alloy to form the compound known to exist as $Ag_3Hg_4$.

The association of these related matters made very pertinent the question as to what happens when a setting mass of mixed and mulled alloy and mercury is

*Read at the annual meeting of the International Association for Dental Research, Chicago, Ill., March 16, 1935.

1. Ward, M. L., and Scott, E. O.: Effects of Variations in Manipulation on Dimensional Changes, Crushing Strength and Flow of Amalgams, J.A.D.A., 19:1683 (Oct.) 1932.

allowed to lie untouched for some time. In the previous report, we showed that amalgams for dental fillings exhibited shrinkage and expansion, both of which were subject to increase and decrease in amount with manipulation well within

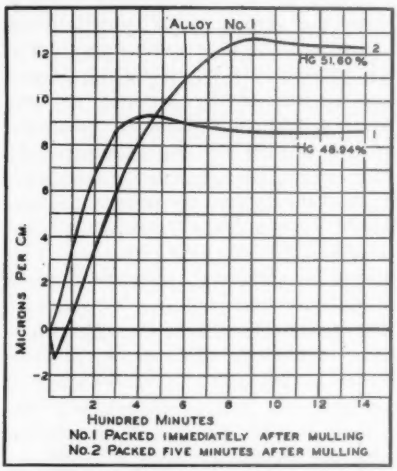


Fig. 1.—Effect on volume change and mercury content of finished specimens.

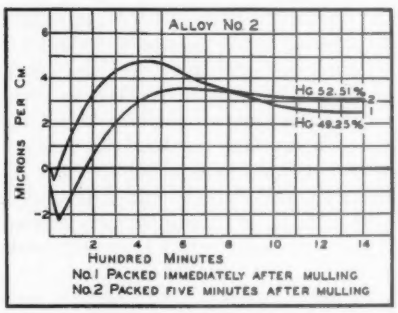


Fig. 2.—Effect on volume change and mercury content of finished specimens.

the ranges of good practice. As a result of these observations, we suggested that the range provided for this dual volume change, variable in amount with manipulation, in the specifications for this material should be moved farther away from the zero point, in order to avoid having the ultimate volume upon final setting less than it was when the material was inserted in a tooth or receptacle for testing purposes. This has been done, and the range of volume changes now permissible is from 3 to 13 microns expansion, while it was formerly from 0 to 10 microns.

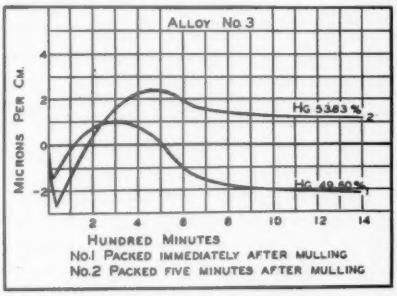


Fig. 3.—Effect on volume change and mercury content of finished specimens.

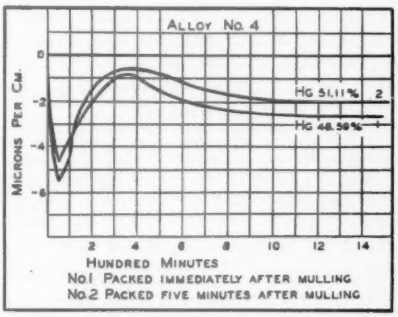


Fig. 4.—Effect on volume change and mercury content of finished specimens.

Since our previous work had shown some forms of manipulation capable of producing several microns variation, and since the changed specifications were only 3 microns above the zero point, the question raised by some of our corre-

spondents seemed even more pertinent.

In the previous work, we had shown that the work done in effecting the combination of the alloy and mercury influenced volume change very materially and had to be kept under control.

Many of those who read our work and observed the precautions necessary to control the work done on the alloy and mercury had been accustomed to the removal of the excess mercury at the end of the mixing and mulling process. If, during the insertion of their fillings, the mass became too stiff for use, they had been remixing it, often adding more mercury. This additional work on the mass, having been shown to produce detrimental results, was what they chose to avoid.

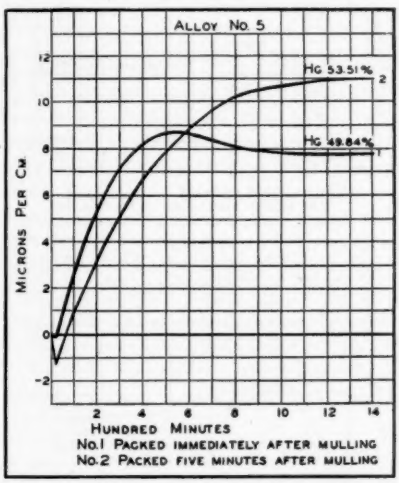


Fig. 5.—Effect on volume change and mercury content of finished specimens.

In response to their requests for information about what to do to avoid this overwork in cases wherein delays in the packing process were caused by one thing or another, we advocated what seems to be sound procedure, i.e., nôt to remove the mercury from the mixed and mulled mass. This keeps the mass from getting too stiff for packing for several minutes. As portions are broken off the main mass for packing, some of the mercury may be removed if it is too soft for good packing.

Many raised the question immediately about the possibility that a mixed and mulled mass of alloy and mercury which was allowed to lie for several minutes and was setting rapidly retained mercury which would not be removed during the packing process with hand pressures. In other words, they regarded it a probability that the finished specimens or fillings would have a higher mercury content than would be the case otherwise. This having been shown in our previous work to influence volume change, we suspected that it probably affected strength also.

In view of the fact that our previous report related primarily to the effect of variations on volume change and only a little on strength, and in view of the situation which developed through correspondence, we instituted two studies. One was the effect on volume change when a mass of mixed and mulled alloy and mercury is allowed to lie untouched for a period of five minutes at room temperature, and the other was the effect on flow of varying percentages of mercury in the finished specimen or filling. Since the crushing test has been dropped as a practical measure of strength of amalgam and since we have presented some data on it in our previous report, it has not been included in our work this time.

In order that this report might constitute a continuation of the previous one, we used the same products from the same batches used for the previous work. We also used the same instruments and same technic as was used for normal mixing and packing.

The accompanying graphs (Figs. 1-5)

show the effect on volume change and mercury content of the finished specimens.

It may be noted that the curves showing volume change are of the same general shape and location as those presented in the previous report for normal mixing of these products and varying the time of mixing.[2]

Variations of a micron or two, one way or the other, is shown, but this may be explained by the fact that these products were more than a year older when the latter tests were made, and thus the reactions of alloy and mercury were slightly and, in this case, irrelevantly different.

expansion of the specimen that had the greater mercury content if the alloy were an expanding one, and less contraction if it were a contracting one, the specimen thereby exhibiting essentially the same behavior with respect to volume change as when no mercury is removed during the mulling and mixing process. The clinical significance of these phenomena is apparently negligible when considered alone. If three or four more microns volume change were added to that of an alloy which was manufactured near the limits permitted by the specifications, a disqualification of the product might result. It appears at this time that there is a wide-

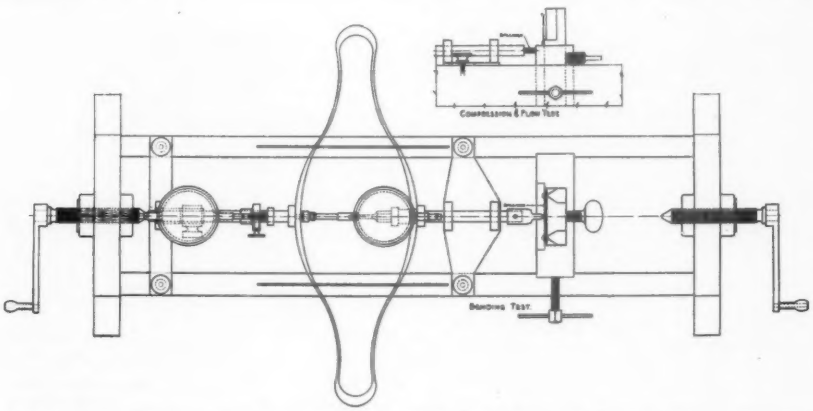

**Fig. 6.—Combination flow testing, bend testing and stiffness testing machine. The two circles represent the location of two micrometers. The one within the spring is calibrated so that when compressed it indicates the number of pounds applied to the spring. The one outside indicates the travel of the equipment plus the compression of the spring. The difference between what is indicated on the two dials shows the flow or the amount of bending under different loads.**

It may also be noted that, in every case, there was more mercury in the finished specimen that had been allowed to lie for five minutes before it was packed than there was in the one that had been packed immediately.

In every case, there was a little more

spread inclination to accept the suggested technic of not removing the mercury from the mixed and mulled mass, as well as the analogous technic of not removing it during mixing and mulling. Both seem to be practicable, and the effect on volume change is now known. It would seem, therefore, that due allowance may be

2. Footnote 1, pp. 1695-1697.

made by the manufacturers in the location of the shrinkage and expansion ranges for their products, the phenomena being of little concern to dentists and teachers when the manufacturers have made allowance for it.

The second thing about which we desire to report is the relationship between

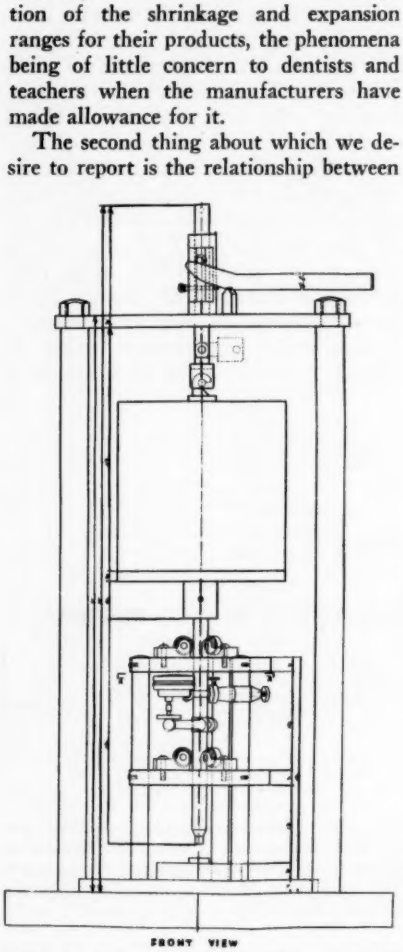


Fig. 7.—Improved flow machine developed since publication of previous work.

mercury content and flow. The use of the amount of flow, or creep, of a material under a load as the only measure of strength, as is now the case with the specifications for amalgam, furnishes an interesting situation for teachers. Flow or creep under a load is associated with metals and alloys at both low and high temperatures and is often included in discussions concerning the four most commonly used indices of behavior of metals and alloys under stress, hardness, tensile strength, proportional limit and percentage of elongation. While it is often important in the determination of the four properties mentioned, it is not used to an extent that often makes it practicable to set a standard for it, nor to consider it as anything but ancillary to the determination of the other properties. Teachers, therefore, who are obliged to discard all of the principal indices of behavior of materials under stress, and adopt the amount of flow as the only practical index of the strength of amalgam, are confronted with the necessity to go back into the fundamentals of physical metallurgy farther than many of them are now prepared to go, if their students comprehend the significance of the term flow.

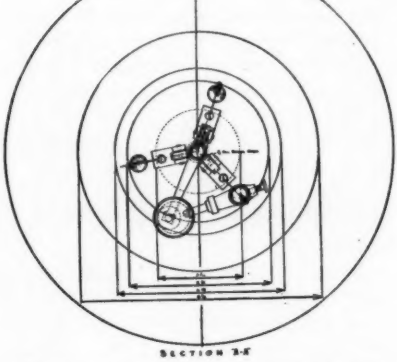

Fig. 8.—Cross-section of instrument shown in Figure 7.

It is not difficult to convey the ideas that where abrasion and deformation are

to be resisted, hardness is required; where resistance to bending is required, a high proportional limit is necessary; where workability is needed, a high percentage of elongation is desirable, and where ultimate rupture resistance is desirable, ultimate tensile strength is a good index. But to drop these common indices of behavior and, after several decades of experimenting with this material, adopt the property of flow as the only index of behavior under stress must be considered significant of its importance.

The literature contains many references to compressive strength of this material, and from January, 1929, to January, 1931, there was a standard for its

Fig. 9.—Type of occlusion which permits retention of well condensed 24-carat gold and hard gold alloys in cast form even with no retention along the buccal and lingual walls of the cavity.

measurement. On account of its impracticability, it was dropped on the latter date.

The accumulating importance of flow as an index of behavior of this material in practice, together with an extended acquaintance with the effect of mercury on mechanical properties of other metals and alloys, made the subject appear a suitable one for study in view of the content of the previous report.

We chose for this study an alloy from the market which was known to be low in copper content. From this composition, we thought that the amount of flow would be comparatively high. In fact, we doubted that it would, under normal conditions of manipulation, meet the specifications for flow for this material which has provided, since Jan. 1, 1934, that a cylindrical specimen 4 by 8 mm. would shorten not to exceed 4 per cent of its length during the twenty-four hours following a 3-hour period of setting, under a load of 69.146 pounds or 3,550 pounds per square inch. The formula was as follows: Sn, 25.63; Ag, 70.25; Cu, 2.35; Zn, 1.68; Al, trace. It may be noted that the formula is of the conventional type except that the copper content

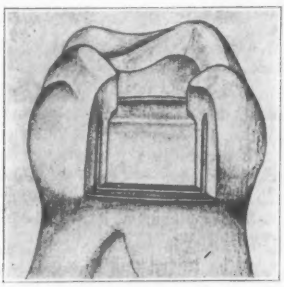

Fig. 10.—Cavity showing buccal, lingual and cervical grooves, which are suggested as aids in preventing movement of proximal portion of filling. Because of the low tensile strength of amalgam and its large amount of flow, this type of cavity is suggested even though the step portion of the cavity is large.

is too low and the zinc probably a little high. The alloy showed desirable dimensional changes and was easily manipulated.

Having shown in the previous report that up to approximately 128,000 pounds per square inch pressure, the mercury content decreased with increasing pressure, we used varying packing pressures in order to show the variety of results that may be obtained in practice when

varying packing pressures make the mercury content also variable.

Table 1 shows the amount of flow of this material with standard sized specimens and loads, normal technic as described in our previous report and room temperature, but with varying packing pressures as indicated.

It may be noted that with pressures varying from the little produced by jarring the mold up to 80 pounds, the flow was varied from a little over 10 per cent to a little over 1 per cent, and that at 10 pounds packing pressure, the amount of flow was 3.54 per cent, an amount which would bring this alloy just within the specifications, which are 4 per cent. The magnitude of the clinical significance

TABLE 1.—AMOUNT OF FLOW OF ALLOY TESTED

| | |
|---|---|
| Jarred into mold | 10.17 per cent |
| 2½ pounds 2 mm. plugger | 6.24 per cent |
| 5 pounds 2 mm. plugger | 5.80 per cent |
| 10 pounds 2 mm. plugger | 3.54 per cent |
| 20 pounds 2 mm. plugger | 2.98 per cent |
| 40 pounds 2 mm. plugger | 1.86 per cent |
| 80 pounds 2 mm. plugger | 1.12 per cent |

of these data must become apparent to anyone when it is observed that the maximum amount of flow allowable in the specifications for this material may be exceeded in practice by 150 per cent under unfavorable conditions.

From these data, we feel justified in urging again that compliance with specifications include directions that adequately cover the principal variations that occur in practice.

In order to show the further significance of the flow test in practice, we have conducted some tests to show that the amount of flow which occurs within the twenty-four-hour period of observation provided for in the specifications is only a small portion of what ultimately takes place when the material is subjected to a load as it frequently is in practice. Table 2 shows a comparison of the flow for thirty days on two specimens, one of 24-carat gold and one of amalgam, both made according to the specifications for testing for flow on amalgams. The gold was in the annealed condition. The amalgam specimen was made from an alloy from the market which was regarded as one of the best and which

TABLE 2.—FLOW TESTS

| | Amount for Gold | Amount for Amalgam | Amount in One Day |
|---|---|---|---|
| | Inch | Inch | Inch |
| During application of load (20 seconds) | 0.0049 | 0.0015 | |
| End of 1 day | 0.0051 | 0.0090 | 0.0075 |
| 2 days | 0.0051 | 0.0129 | 0.0039 |
| 3 days | 0.0051 | 0.0148 | 0.0019 |
| 4 days | 0.0052 | 0.0177 | 0.0029 |
| 5 days | 0.0052 | 0.0199 | 0.0022 |
| 6 days | 0.0052 | 0.0222 | 0.0023 |
| 7 days | 0.0052 | 0.0240 | 0.0018 |
| 8 days | 0.0053 | 0.0255 | 0.0015 |
| 9 days | 0.0053 | 0.0271 | 0.0016 |
| 10 days | 0.0053 | 0.0288 | 0.0017 |
| 11 days | 0.0054 | 0.0303 | 0.0015 |
| 12 days | 0.0054 | 0.0318 | 0.0015 |
| 13 days | 0.0054 | 0.0332 | 0.0014 |
| 14 days | 0.0054 | 0.0347 | 0.0015 |
| 15 days | 0.0055 | 0.0360 | 0.0013 |
| 16 days | 0.0055 | 0.0375 | 0.0015 |
| 17 days | 0.0055 | 0.0388 | 0.0013 |
| 18 days | 0.0056 | 0.0403 | 0.0015 |
| 19 days | 0.0056 | 0.0416 | 0.0013 |
| 20 days | 0.0056 | 0.0422 | 0.0006 |
| 21 days | 0.0056 | 0.0430 | 0.0008 |
| 22 days | 0.0057 | 0.0439 | 0.0009 |
| 23 days | 0.0057 | 0.0449 | 0.0010 |
| 24 days | 0.0057 | 0.0460 | 0.0011 |
| 25 days | 0.0057 | 0.0470 | 0.0010 |
| 26 days | 0.0057 | 0.0478 | 0.0008 |
| 27 days | 0.0057 | 0.0487 | 0.0009 |
| 28 days | 0.0057 | 0.0497 | 0.0010 |
| 29 days | 0.0057 | 0.0508 | 0.0011 |
| 30 days | 0.0057 | 0.0520 | 0.0012 |

showed the following formula: Sn, 25.30; Ag, 68.94; Cu, 4.81; Zn, 0.93.

The first thing to which attention is invited is the fact that flow continued throughout the thirty days with both the amalgam and the gold, but was much greater with the amalgam. These may be interesting phenomena for some of those who discredit the use of 24-carat gold and advocate the use of hard golds, but accept amalgam, not knowing that amalgam does not cold work and get hard and reduce its flow to the same extent that 24-carat gold does.

It may be noted that, in the first line, we have indicated the amount of flow that takes place while the load is being applied. We were obliged to do this to carry out our desire to see the difference in the total effect on flow with a sustained load which would cold work the two materials in much the same manner as drawing, rolling, hammering, etc., does. As the specifications for flow provided that the flow readings should begin after the load was applied, we found ourselves confronted with the necessity of developing an instrument for this purpose, an illustration and brief description of which are shown in Figure 6. The improvements that we have made in the machine used and shown in our previous report are also illustrated. (Figs. 7-8.)

During the application of the load, gold flowed about three times as much as the amalgam did, but after that the gold flowed but little, while amalgam continued at a much greater rate, ending with a total of 0.0520 inch, an amount about sixty-three times greater than gold.

With these two tests, we desire to invite the attention of the profession to the great clinical significance of the elimination of all other tests of mechanical properties and the adoption of the flow test. It should be obvious that this flowing property of amalgam is much greater as to amount and more easily produced than we supposed. This long misunderstanding has apparently caused many clinical failures which could have been successes, and unless more attention is given to a specific cavity preparation for this material, many of those who have indicated a desire to meet their obligations in a rapidly changing situation will not realize their ambitions.

The use of well condensed 24-carat gold, and hard gold alloys in cast form has permitted the profession to succeed in filling cavities in teeth where the occlusion was similar to that shown in Figure 9, even if there were no buccal and lingual retentions to the cavity. In other cases, where the force of occlusion of an opposing tooth has been applied upon the proximal margin instead of the center of the sulcus, the employment of the hard gold alloy, suspended inlay has resulted in success in a large number of cases because of the strength of the gold alloy, even though there were no seating nor leaking except of the occlusal portion.

In other cases, early teachings which have been too much on the order of standardization have prevented recognition of the situation that has developed as a result of recent work on amalgam. Many letters have been received indicating that the writer regarded a cavity as just a cavity, rather than a retention form to be modified to meet the requirements of the different materials to be retained.

In either of the cases mentioned, it will require only a small force to cause the proximal portions of fillings in molars and bicuspids to move, if they are not well seated, and either locked with lateral retention as shown in Figure 10 or both cemented and locked.

# HISTORICAL REVIEW OF THE RESEARCH ACTIVITIES OF ORGANIZED DENTISTRY*

By HOMER C. BROWN, D.D.S., F.A.C.D., Columbus, Ohio

ANY one familiar with the progress of the dental profession for the last quarter of a century must recognize that, during the greater part of this period, the interest in and the influence of scientific research has been a very potent and constructive factor. This has been especially true since the creation of the Scientific Foundation and Research Commission at the time of the reorganization of the National Dental Association at Kansas City in 1913. As a result of the activities of this commission, research has shared honors with education and legislation, which have been the principal influences in the evolution of the practice of dentistry after its first recognition as a profession in 1840. In view of this, and in order that a dependable and permanent record of the development of dental research might be compiled, the Research Commission, at the 1933 Session, appointed a committee for that purpose, consisting of Homer C. Brown, chairman, Thomas B. Hartzell and Clinton T. Messner. This action was the result of a recommendation by the Trustees. In harmony with this authorization, and with the approval of the other members of the committee, the chairman accepted an invitation to present these data before the Research Section of the American Dental Association at its 1934 meeting in St. Paul.

*Reviewed and approved as the report of the committee authorized to compile this historical résumé.

*Read before the Section on Histology, Physiology, Pathology, Bacteriology and Chemistry (Research) at the Seventy-Sixth Annual Session of the American Dental Association, St. Paul, Minn., Aug. 9, 1934.

### FIRST RESEARCH COMMITTEE

A review of the minutes of the official transactions of the National Dental Association reveals that the first reference to any research activity was in 1908, when a committee on scientific research was authorized, and the following were appointed members: Henry C. Ferris, chairman, Brooklyn, N. Y.; L. E. Custer, vice-chairman, Dayton, Ohio; Charles Channing Allen, secretary, Kansas City, Mo.; Joseph Head, Philadelphia, Pa.; H. C. Register, Philadelphia, Pa., and M. C. Smith, Lynn, Mass.

Dr. Ferris was reappointed in 1909, 1910 and 1911, serving as chairman during this time. At the Birmingham, Ala., meeting, in 1909, he submitted a report of the Committee on Scientific Research, which will be found on page 116 of the 1909 Transactions. The first paragraph of this reads:

> Your Committee has organized, and taken up the study of "Salivary Analysis," as being the most important study before the profession at the present time.

At the Denver meeting in 1910, the chairman made a second report relating to the same subject, and M. C. Smith, as a member of the committee, submitted a supplementary report, the last paragraph of which was as follows:

> He (Dr. Smith) would recommend to the society that they suggest to the next

committee on research work that they make a special effort, and concentrate their work on saccharomycetes and actinomycosis during the coming year.

At the same meeting, Weston A. Price, Cleveland, Ohio, presented a paper on "The Behavior of Gold in Fusing and Casting," in which he made this recommendation:

The profession should establish research laboratories equipped and maintained for continually following up and perfecting these fundamental requirements for our professional services, as the rapid march of dental progress is constantly presenting new problems and methods that are based upon materials and principles that have not been studied in connection with the other and older sciences.

At the Cleveland meeting, in 1911, Dr. Ferris presented a report containing a number of charts, which will be found on pages 78 to 95 of the 1911 Transactions. The personnel of the committee was increased that year to ten, nine of whom were affiliated with dental colleges and special subjects assigned to each; all of which is contained in the chairman's report found on pages 96 to 100 of the 1912 Transactions.

### INAUGURATION OF PRESENT RESEARCH PROGRAM

At the Washington meeting, 1912, C. M. McCauley, Abilene, Texas, presented a paper on "The Great Need of Improvement in the Manufacture of Dental Alloys," which appears on pages 127 to 136 of the 1912 Transactions. This was presented before Section 1, with Weston A. Price, chairman, Harry E. Kelsey, vice-chairman and Marcus L. Ward, secretary. A lengthy discussion followed Dr. McCauley's presentation and, at the close, W. E. Lundy, Memphis, Tenn., made the following motion, which prevailed:

I move that this Section appoint a committee to meet with the Executive Council, take up this matter, and do what can be done to get the results we desire. And further, that this Section request the Council to cooperate with the committee.

As an evidence of constructive cooperation, a paragraph from the Minutes of the Executive Council, under date of September 12, 1912, is herein incorporated:

Dr. C. M. McCauley addressed the Council as a representative from Section 1 regarding a research fund for investigation. After some discussion he was authorized to confer with Dr. Weston A. Price, Chairman of Section 1, and to report later. The following day's records show that: Dr. Weston A. Price addressed the Council relative to the advisability of investigating the possibilities of securing our support or cooperation in doing certain experimental and research work. On motion Drs. Weston A. Price, Arthur R. Melendy and C. M. McCauley were appointed a special Committee to investigate and report at the next meeting.

During the following year, this committee was very active and at the First General Meeting of the National Dental Association, in Kansas City, July 8, 1913, Dr. Price, as chairman, presented a detailed report, which will be found on pages 6 to 10 of the 1913 Transactions. This report was unanimously adopted and the necessary provisions were promptly incorporated in the new Constitution and By-Laws, creating the Scientific Foundation and Research Commission, which has efficiently functioned since that time; although the name was changed in 1925 to the Research Commission of the American Dental Association.

### PERSONNEL OF THE FIRST COMMISSION

As a matter of permanent record, the personnel of the first Research Commission is herein listed:

Homer C. Brown, Ex-Officio (President), Columbus, Ohio.

Otto U. King, Ex-Officio (General Secretary), Huntington, Ind.
Weston A. Price (Chairman), Cleveland, Ohio.
Thomas P. Hinman (Vice Chairman), Atlanta, Ga.
Clarence J. Grieves (Secretary-Treasurer), Baltimore, Md.
John V. Conzett, Dubuque, Iowa.
Eugene R. Warner, Denver, Colo.
Edward C. Kirk, Philadelphia, Pa.
William Carr, New York City.
Truman W. Brophy, Chicago, Ill.
Greene V. Black, Chicago, Ill.
M. H. Fletcher, Cincinnati, Ohio.
Thomas B. Hartzell, Minneapolis, Minn.
Arthur R. Melendy, Knoxville, Tenn.
Edward S. Gaylord, New Haven, Conn.
Henry C. Ferris, New York City.
Charles Channing Allen, Kansas City, Mo.
Frank O. Hetrick, Ottawa, Kan.
Marcus L. Ward, Ann Arbor, Mich.
Frank L. Platt, San Francisco, Calif.
Chris S. Van Horn, Bloomsburg, Penn.
Roscoe H. Volland, Iowa City, Iowa.
C. M. McCauley, Abilene, Tex.
George E. Hunt, Indianapolis, Ind.
Eugene H. Smith, Boston, Mass.
James E. Chace, Ocala, Fla.
Samuel H. McAfee, New Orleans, La.

PERSONNEL OF THE PRESENT COMMISSION

The personnel of the present Commission is listed for similar purposes:

A. C. Wherry, Ex-Officio (President), Salt Lake City, Utah.
Frank M. Casto, Ex-Officio (President Elect), Cleveland, Ohio.
H. B. Pinney, Ex-Officio (General Secretary), Chicago, Ill.
Thomas B. Hartzell (Chairman), Minneapolis, Minn.
C. T. Messner (Secretary), Washington, D. C.
Arthur D. Black, Chicago, Ill.
W. H. Crawford, New York City.
H. C. Fixott, Portland, Ore.
J. T. O'Rourke, Louisville, Ky.
Weston A. Price, Cleveland, Ohio.
Theodor Blum, New York City.
Homer C. Brown, Columbus, Ohio.
E. D. Coolidge, Chicago, Ill.
Edouard M. Hall, Kansas City, Mo.
J. L. T. Appleton, Jr., Philadelphia, Pa.
E. P. Brady, Clayton, Mo.
John P. Buckley, Hollywood, Calif.
Albert R. Ross, Lafayette, Ind.
Kurt H. Thoma, Boston, Mass.
Harry E. Kelsey, Baltimore, Md.
P. C. Lowery, Detroit, Mich.
R. H. Volland, Iowa City, Iowa.
Alfred Walker, New York City.
W. R. Wright, Jackson, Miss.
Fred R. Blumenthal, Boston, Mass.
William A. Grey, St. Paul, Minn.
William Hopkinson, Milwaukee, Wis.
M. D. Huff, Atlanta, Ga.

COMMISSION OFFICERS AND CONTINUOUS SERVICE

It may be of interest to record that Drs. Price, Volland and Brown have served continuously, since 1913, as members of the commission. Also, Dr. Price served as chairman of the commission and executive board, from 1913 to 1919, when the following were elected: Frank O. Hetrick, chairman; Homer C. Brown, vice chairman; Roscoe H. Volland, secretary; Louis Meisburger, treasurer, and Charles H. Oakman as the fifth member of the executive board. L. L. Barber succeeded Dr. Oakman the following year, serving until his death in 1929. Dr. Meisburger also served until his death, in 1927. Dr. Hetrick served until 1932 when he resigned on retiring from practice, and was succeeded by Dr. Hartzell, the present chairman. In 1927, Dr. Volland resigned as secretary and was succeeded by Dr. Brown, who served until 1932, when he resigned and was succeeded by Dr. Messner, the present secretary.

RESEARCH INSTITUTE INCORPORATED

In harmony with the recommendation of the Scientific Foundation and Research

Commission, approved by the House of Delegates of the then National Dental Association, the Research Institute of the National Dental Association was incorporated under the laws of the State of Ohio, June 26, 1915, with the following incorporators, in the order named: George W. Crile, Homer C. Brown, Edward A. Petrequin, Harry J. Crawford and Weston A. Price. Dr. Crile was an internationally known surgeon, Mr. Crawford, a prominent attorney, and Mr. Petrequin, a well-known business man, all of Cleveland.

Subsequently, the following were elected trustees: Weston A. Price, Thomas P. Hinman, Clarence J. Grieves, Edward A. Petrequin, John V. Conzett, Eugene R. Warner, Harry J. Crawford, George W. Crile and Homer C. Brown. The trustees organized by electing Dr. Price chairman, Dr. Grieves secretary and Mr. Petrequin treasurer. Shortly thereafter, an improved property, located at 8803 Euclid Avenue, Cleveland, was purchased, as the home of the research activities. The fee of this property is in the name of the American Dental Association, as the charter was surrendered and the corporation dissolved, Oct. 13, 1925.

At the time of the purchase of the Research Institute property, each trustee contributed to a fund for making the initial payment and others obligated themselves to make stipulated annual payments for a period of five years, but this was to be used in dental research. Moreover, various groups and interested persons contributed to a fund for the purchase of the property and equipping the building. As an evidence of this, I incorporate the first paragraph of a letter Dr. Price wrote to the officers of the state dental societies and others, under date of Dec. 13, 1915:

We have just returned from the meeting of our Ohio State Dental Association and are writing to report the magnificent support that has been given to our work. From the time of the opening session of the Convention, at which they voted $4,000 from the treasury to the Building Fund of the Research Institute of the National Dental Association, to the closing session on the fourth day, every period was filled with enthusiasm in the expressed effort to give every possible support to the national research movement. We also secured, as gifts from the dental exhibitors, practically a complete dental equipment for the institute, amounting to upwards of $2,000, and about $1,000 was added to the current research fund, making a total of about $7,000. This is an illustration of the earnest cooperation that our dental profession is giving in establishing this work.

### WORK OF DRS. PRICE AND HARTZELL

It is not my purpose to attempt to evaluate the results of those who conscientiously undertook the solution of many of our unknown and complicated problems, since time and clinical application will be required before the true value of some of their efforts can be definitely determined. I have publicly stated on many occasions that the enthusiasm evidenced by Dr. Price in this project was the impelling force in the initiation and advancement of this research program. Quite logically, he was ably and loyally supported by the members of the commission and the trustees of the Research Institute, but he must be accorded the major portion of the credit for the manner in which this was received and supported by the profession. Dr. Price also addressed many dental organizations and other groups during the early period of this research movement and was responsible for thirteen state societies increasing their dues $1 a year, to be specifically allocated to research.

On similar occasions, I have also given

Dr. Hartzell full credit for his consistent and constructive contributions in not only organizing a most efficient group of researchers at the University of Minnesota, but also in disseminating the results of their activities before organizations and in professional journals. Fortunately for the commission, the Association, the profession and the public, he is rendering an important service as chairman of the commission.

### CRITICISM VERSUS COMMENDATION

Like all new movements, it was quite natural for some criticism and jealousy to develop, which were probably prompted by the allocation of grants to universities well equipped to conduct certain phases of research. This, and the drafting of most of the technicians at the Cleveland headquarters during the World War, resulted in the commission's discontinuing the work there and adopting a policy of making grants direct to such universities as were equipped with the necessary facilities for conducting a cooperative research program. Especially was this given favorable consideration when these institutions were willing to allocate an amount equal to, or in excess of, the amount appropriated by the commission.

This research program developed a keen interest in the profession, particularly with the dental college faculties, and was responsible for much favorable comment from the medical profession and the public. The profession was praised for its determined effort and ability to finance its problem where medical research was largely being supported by philanthropists and funds appropriated by some of the well-known foundations. In spite of all this favorable recognition and publicity, several efforts were made to reorganize the commission. The first was in 1919, which was the result of certain criticism; the second was in 1923, when a proposal was urged to reduce the commission to nine members, one from each trustee's district. In 1924, and again in 1927, proposals were submitted for reducing the commission to five members. All of these failed because those deeply interested in the activities of the commission appreciated the advantage of having representative contact men in the different sections of the country, who, as members of the commission, were deeply interested in its success. This was very helpful, even though some of these members were only called on to render a limited service, such as functioning as an advisor on a cooperative research grant and meeting with and discussing these problems with the commission at the time of the annual meetings of the Association.

It was generally recognized and understood by all that the executive board served in the interim with full authority to conduct the general affairs of the commission. This board only formulated the program and submitted it, through an established procedure, to the full commission for consideration. If the program was approved, it was referred to the Budget Committee, the Trustees and the House of Delegates for final action.

### EXPENDITURES IN RESEARCH ACTIVITIES

Since the National Dental Association inaugurated this research program, the commission has expended $359,705.36, up to and including June 30, 1934. In addition to this, it is fair to assume that more than $100,000 was expended during its formative period, which is not included in the foregoing. In support of this, one paragraph is incorporated from a financial statement submitted to the Officers, Trustees, Delegates and members of the National Dental Association, July 20, 1916, by Dr. Price, acting managing director of the Research Institute. (Table 1.)

Supplementing this, the plan of allocating these grants justifies the assumption that more than double the amount appropriated by the Association was expended in promoting dental research, not including the necessary facilities furnished by these institutions and others.

### INITIAL GRANTS

Most of the early grants were made for biologic research, and it should be recognized that it is not possible to present dependable findings as promptly as some would expect or demand. Also, as the result of a reduced income, it became necessary to limit the appropriation for this important activity of organized dentistry, and when the biologic group was required to assume the major portion of this reduction, they were keenly disappointed. But, fortunately, in most of the universities, where this work had been generously supported for several years, it was recognized as being so essential that, in practically every instance, the program was continued and frequently augmented, in spite of the necessary financial retrenchment in many of these.

### STATEMENTS IN EARLY ISSUES OF BULLETIN

In the first article appearing in Vol. 1, No. 1, of the November, 1913, issue of the *Official Bulletin of the National Dental Association, entitled* "Greetings from the President," I made the following statement:

Appreciating that there are some members of our profession who are active in their state societies, but seemingly have no desire or ambition to assume similar relations with the national, prompts me to anticipate their question: "What will be the benefits of the national and what will the national do for me?"

First, an organization with a membership anything like the number above given (15,000) is certainly worthy of most favorable consideration and can be expected to wield a progressive influence in many ways. We need only to refer you to two instances more fully presented in this, the first issue of our *Bulletin;* the announcement of the Scientific Foundation and Research Commission and the Relief Fund Committee. The one is conducting an aggressive campaign which we think will do more to advance the dental profession in the estimate of the learned professions and the laity, than any other movement heretofore undertaken. The success of their efforts will not only bring credit and benefit to every dentist, but the greatest benefit will be for the uplift of humanity. The other plans to make easier the closing days of those of us who may be so unfortunate as to need just such assistance as can be rendered through such a fund and such an organization as ours. The liberal contributor of this decade, when he is a producer, may be the grateful recipient of such aid in the next, when he is

TABLE 1.—FINANCIAL STATEMENT

| Equities | |
|---|---|
| Research Fund | |
| Total cash and pledges, September, 1912 to July 20, 1916 | $ 70,076.59 |
| Building Fund | |
| Total cash and pledges to July 20, 1916 | 29,155.39 |
| Equipment | |
| Special donations to Institute | 3,882.70 |
| Total | $104,114.68 |

a nonproducer. I respectfully request that you read both of these announcements and ask yourself the question: "Is it not a duty, aye, should it not be a privilege, to belong to and assist this Association in every possible way, even if nothing was to be accomplished by cooperation in securing national legislation, uniform state legislation, due and adequate recognition in public health and school questions and a uniformity in the dissemination of information to better educate the laity as to the proper use and care of the mouth and teeth?

There appears in this same issue a "Report of Progress" submitted by Dr. Price, relating to the Scientific Foundation and Research Commission. In this, he refers to two assistants being provided for Thomas B. Hartzell in a study of the relation of certain systemic infections to dental foci; one to Russell W. Bunting, in the study of the saliva in its relation to caries; one to G. V. Black, in the study of salivary calculus; one to George W. Cook, in the study of etiology of erosion, and one to himself, in the study of metallurgic problems.

In No. 2 of this volume, issued in March, 1914, there are research reports submitted by the executive board of the commission, as well as by Drs. Hartzell and Price. In Vol. 1, No. 3, issued in June, 1914, the executive board submitted an interesting progress report incorporating the amounts subscribed by the various states, totaling $38,439, of which Ohio contributed $11,082.

### PLAN FOR ALLOCATING GRANTS

The commission's plan for considering and allocating grants, during its most active years, is given in Table 2.

The applicant was required to submit full data regarding his qualifications, the facilities available and the problem to be studied. This was first reviewed by the executive board and, if tentatively approved, was submitted to a special committee of the National Research Council, in harmony with previous arrangements, for its consideration. If approved, it was presented to the full commission at the annual meeting, and, if concurred in, it then went to the Budget Committee, the Trustees and the House of Delegates, in the order named, for final action.

Table 2.—Commission's Plan for Allocation of Grants

| | |
|---|---|
| University of Minnesota | $ 4,200.00 |
| Forsyth Dental Infirmary | 4,000.00 |
| Northwestern University | 3,000.00 |
| University of California | 2,000.00 |
| California Stomatological Research Group | 1,500.00 |
| University of Louisville | 1,500.00 |
| University of Michigan | 2,000.00 |
| University of Pennsylvania | 1,500.00 |
| Western Reserve University | 1,000.00 |
| West Texas Dental Society | 1,000.00 |
| Bureaus of Standards | 600.00 |
| Executive board, chairman, secretary and deficit item | 2,258.27 |
| | $24,558.27 |

### COMPARATIVE APPROPRIATIONS FOR THREE YEARS

The appropriations for 1925-1926 are given in Table 3.

Of the appropriations listed, only $21,459.55 was expended. The largest

annual appropriation was $32,150, in 1928-1929, of which $29,286.26 was disbursed. In addition to this, the Trustees appropriated $2,250 to meet two outstanding obligations, details of which will be found on page 112 of the 1929 Transactions. The grants for that year are given in Table 4.

Only $2,513.36 of the last item of $3,600 was expended. For the last few years, as a result of reduced revenues and the establishing of other activities, the appropriations for the Research Commission have been gradually decreased until only $11,500 was appropriated last year, of which $10,142.92 was expended. The allocated grants and the expenditures for 1933-1934 are given in Table 5.

The grants allocated and the activities of the commission for these three years have been incorporated for comparative purposes, but the inclusion of all similar data, the individual workers and other involved details, since the commission was created, would make this presentation entirely too lengthy. Those desirous of securing complete details will find these incorporated in the reports of the commission, as published in the annual *Transactions of the American Dental Association*. For instance, the report of the commission's activities for 1925-1926 will be found on pages 70 to 85 of the 1926 Transactions, and that of 1928-1929, on pages 93 to 112 of the 1929 Transactions. The reports for 1933-1934 will be found on pages 135 to 142 of the reports of officers and committees for this year, and will be published later in the official transactions.

TABLE 3.—APPROPRIATIONS FOR 1925-1926

| | |
|---|---|
| University of Minnesota (principally bacteriology) | $ 3,000 |
| Forsyth Dental Infirmary (pathology and diet) | 3,500 |
| Northwestern University Dental School (histology and chemistry) | 3,000 |
| University of California (diet, metallurgy and pyorrhea) | 3,500 |
| University of Louisville (histology, pathology and biology) | 1,500 |
| Texas Dental Society (mottled enamel) | 750 |
| University of Michigan (bacteriology and root canal technic) | 2,000 |
| Western Reserve University (histologic development of the enamel organs) | 1,500 |
| University of Southern California (paleodontology) | 500 |
| Johns Hopkins University (swine feeding experiment, Bureau of Animal Industry at the U. S. Department of Agriculture) | 1,800 |
| The National Bureau of Standards (metallurgic and allied problems) | 7,500 |
| Executive board, special committees, chairman and secretary | 3,600 |
| | $32,150 |

TABLE 4.—GRANTS FOR 1928-1929

| | Grant | Disbursed |
|---|---|---|
| The National Bureau of Standards | $ 8,800.00 | $ 8,283.15 |
| University of Louisville | 750.00 | 750.00 |
| New York Institute of Oral Pathology | 750.00 | 375.00 |
| Research on Rickets, Johns Hopkins University and Harriet Lane Home | 700.00 | 350.00 |
| Executive Board | 250.00 | 139.12 |
| Secretary's Office | 250.00 | 245.65 |
| | $11,500.00 | $10,142.92 |

### MANY CONTRIBUTORS

Since the commission began functioning in 1913, a great number of research workers have been engaged in various problems and have made many valuable contributions, most of which have been published in THE JOURNAL or other dental or scientific publications. In the allocation of these grants, it was definitely agreed that due credit was to be given to the Research Commission, in all papers and reports, and that THE JOURNAL had first claim on publication. The executive board was given authority to approve of publication elsewhere, provided THE JOURNAL could not publish such papers and reports without too much delay. Unfortunately, there has never been a complete list of these research data compiled as a separate publication, but it seems that this would be quite beneficial to future investigators. Therefore, it is recommended that the Library Bureau be requested to assemble these data, and, if possible, append hereto as a supplement, or give definite reference as to its publication. About three years ago, I discussed this question, through correspondence with the Librarian, to whom all this information is accessible. I recently submitted another inquiry and herein incorporate the following paragraph from Mrs. Hunt's reply:

> In 1931 consideration was given to making such a list, but on studying the subject it was found to be a most difficult list to compile as neither the Index to Dental Periodical Literature nor the indices of the individual dental journals indicated whether or not the paper was done as a result of a grant from the Research Commission of the American Dental Association.

### STIMULATING INFLUENCES

The Research Commission's contribution to the progress in dental practice is a memorable triumph. This program has stimulated a keen interest in practically all of the dental schools and with many individual research workers. One of the best evidences of this will be noted in the annual programs presented, during the past few years, by the International Association of Dental Research.

Another signal recognition in the advancement of dentistry was the election to membership in the American Association for the Advancement of Science, and it is only reasonable to assume that the activities of the Research Commission was a distinct influence to that end. Moreover, one of the most important achievements, as a result of the activities of the commission for twenty-one years, will be noted in the interest in professional research. The encouragement that the cooperative workers have instilled in their immediate colleagues will no doubt stimulate many of them to become interested in solving some of the unknown dental problems.

Also, the following paragraph, relating to the Research Commission, from the report of the Carnegie Foundation for the Advancement of Dental Teaching, published in 1926, is incorporated:

> The Commission, all of whose twenty-five members serve without remuneration and are plainly animated by the most commendable motives, has done more than any other agency to arouse interest in research among dental practitioners and continue to quicken the spirit of enquiry in the American Dental Association.

Several officers of the Army and the Navy Dental Corps have rendered constructive cooperation in some of our problems, especially certain phases of the work at the Bureau of Standards, which stimulated a research interest in the personnel of these services.

Another positive recognition of its influence was the appointment, in 1931, by Surgeon-General Cumming, U. S. Public Health Service, of five dentists as

consultants in dental research to function with this service and the recently created National Institute of Health. Four additional consultants were appointed in 1933.

The National Institute of Health, located in Washington, is an important governmental activity, under the control of the U. S. Public Health Service. It was authorized by an Act of Congress in 1930, and the American Dental Association, through its committee on legislation, actively supported this meritorious legislation. The principal objective of this institute is to provide a place, under governmental regulation and control, where suitable facilities and ample funds are available for the scientific study of all health problems. It was generally understood that these funds would be very largely contributed by wealthy persons desirous of making worth-while contributions for the benefit of afflicted humanity; thus promoting intensive scientific study relating to human diseases, for the purposes of discovering their causes, effecting their cures and, in the last analysis, developing the highest possible standards in the prevention of disease. This, and the recent dental health survey, is convincing evidence that General Cumming and his efficient staff are fully cognizant of the definite relation of oral infection to systemic diseases. Principally, as a result of this recognition, the state and provincial health authorities approved and cooperated in the recent dental health survey, which should have a decided influence in stimulating to an increased interest fundamental dental health education, with all health and school authorities, as well as the general public.

### COOPERATIVE RESEARCH AT NATIONAL BUREAU OF STANDARDS

The cooperative research at the National Bureau of Standards is very largely confined to the physical, chemical and mechanical properties of materials and the developing of standard technics, through which the best results can be secured, in the use of these in the practice of dentistry.

During the period of the World War, it was necessary for the War and Navy departments to make large purchases of dental equipment, supplies and materials in meeting the dental needs of the rapidly increasing personnel of the combined military forces. No standard specifications were available for any of these materials, and the Surgeon General of the Army requested the Bureau of Standards to conduct an investigation and establish certain standards for dental amalgam, in order to make it possible to purchase under definite specifications. It was assumed that this request emanated from those in charge of the Dental Corps' activities, and to secure official confirmation of this, an inquiry was made of Wilmer Souder, chief of the dental laboratory at the Bureau, who advised that the request was submitted by the Surgeon-General of the Army in 1918, but that the correspondence had been destroyed with other useless papers. A similar inquiry was submitted to William H. G. Logan, who was assigned to the Surgeon General's office in charge of the activities of the Dental Corps, during the World War. He advised that, to the best of his recollection, the suggestion was first made by Colonel Bernheim, of the Dental Corps, in charge of the supply division in the Surgeon General's office. The following informatory paragraph from Colonel Logan's letter is incorporated:

> The ultimate action taken was that on behalf of the dental division of the Surgeon General's Office, either at the initiative of the dental division or the supply department of the Surgeon General's Office. A

request was made to the National Bureau of Standards for cooperation in setting up certain tests that could be used to advantage in awarding the necessary purchase of amalgams and cements that were required in large quantities to fulfil the needs in the various locations throughout the United States and Europe where dental officers were stationed.

In connection with the research program at the Bureau, it seems appropriate to incorporate the foreword by the director, George K. Burgess, as it appeared in Circular 296 of the National Bureau of Standards, issued in 1926:

This circular is issued to acquaint interested persons and organizations with the plan for cooperative research worked out at the National Bureau of Standards. This is designed to enable organizations to conduct specific researches on important problems affecting their industry or specialty.

The bureau thus supplements the facilities of organizations conducting research and affords facilities for those who have none. It makes research possible for any organization by loaning equipment, providing quarters, and affording facilities, data and supervision, giving to qualified workers training and experience in research under bureau auspices and cooperation.

The postwar demand for trained research workers drew heavily on the bureau's personnel. The plan provides an agency to meet the growing demand for training in industrial research.

Nine hundred industrial and other experts aid the bureau by service on advisory committees, cooperating in the formulation of research programs by advice and discussion and reviewing the results. The bureau, on its part, is represented on hundreds of technical committees, cooperating on problems which concern the expert groups or technical societies. The research associate plan extends the cooperation from counsel to actual research, under certain simple rules and reasonable restrictions.

## AMALGAM INVESTIGATION STIMULATED OTHER RESEARCH

The results obtained in the studies of amalgam for the Army convinced some well-informed persons that it would be advantageous to establish standard specifications for other materials used in dentistry, especially gold alloys. The feasibility of a cooperative program of this nature was presented to the Executive Officers of the American Dental Association, but for some unexplainable reason, it was not given the serious consideration which it merited. As a result, the Weinstein Research Laboratories recognized a favorable opportunity and established an active contact with the Bureau in January, 1922, which continued until April 1, 1928, when the Research Commission of the American Dental Association finally completed arrangements for its cooperative program.

While the opportunity for establishing this Bureau of Standard's program was presented to the Executive Officers prior to the Weinstein contact, it did not reach the Research Commission for consideration until the Dallas meeting, in 1924. After some investigation, it was generally understood that a satisfactory working arrangement could be formulated in which the dental manufacturers would be the principal financial contributors, but the officials at the Bureau insisted that the program be conducted as a cooperative one in which the Bureau and the American Dental Association were the controlling factors; that is, the results should be approved and disseminated by the two groups. In view of this, it was only considered necessary for the Research Commission to make a small appropriation, and accordingly $600 was recommended and approved that year and a Special Bureau of Standards Committee, composed of Drs. Barber, Brown and Volland,

was appointed to complete arrangements.

After the Dallas meeting, Drs. Barber and Brown held several conferences with Director Burgess, and other members of his staff, during which substantial progress was made for establishing an independent cooperative program. In March, 1926 they, together with Sheppard W. Foster, the President of the American Dental Association, appeared before the Secretary of Commerce, the Hon. Herbert Hoover, requesting his approval of the tentative program which had been formulated. After a few appropriate questions, the Secretary promptly aproved it, but it was too late to secure any Federal funds for that year as the appropriation bill had progressed too far to be amended, as we later ascertained by an interview with the chairman of the Senate Appropriations Committee. The manufacturers had evidenced no interest in assisting in financing the investigation of materials; in fact, they presented positive opposition. Unfortunately, they were supported by some prominent members of the profession, which delayed our progress. Therefore, the plan finally agreed on was that the American Dental Association and the Bureau assume the entire expense of this cooperative undertaking. To that end, $5,000 was appropriated at the 1926 meeting, but none of this was used, as the understanding was that the program would not be started until at least an equal amount of Federal funds was made available. The following year, the Federal Budget carried a $5,000 item for this work, which was increased to $10,000 the next year.

### APPROPRIATIONS BY THE AMERICAN DENTAL ASSOCIATION

In 1928, the American Dental Association appropriated $7,500, of which $6,721.07 was expended. In 1929, $10,000 was appropriated and $9,796.38 expended. In 1930, $10,000 was appropriated, all of which was expended. In 1931, $9,600 was appropriated, of which $7,852.57 was expended. In 1932, $8,800 was appropriated, of which $8,482.28 was expended. In 1933, $8,800 was appropriated, of which $8,283.15 was expended.

From this tabulation, it will be noted that since this work was inaugurated, $54,100 has been appropriated and $51,135.45 has been disbursed. During the six and one-quarter years of this cooperative research, the Bureau has not directly expended quite so much as our Association, but when we consider the facilities afforded through equipment and the highly technical and professional services, available at all times, their contribution is greatly augmented.

### DR. SOUDER AS CHIEF OF LABORATORY

Throughout this entire period, Wilmer Souder, Ph.D., has been the chief of the Dental Laboratory. At the present time, he and Aaron Isaacs, a chemist, represent the Bureau. They are ably supported by Director Briggs and his staff. N. O. Taylor was our first research associate at the Bureau. At present, George C. Paffenbarger, D.D.S., and W. T. Sweeney, B. S., are full time research associates representing the Research Commission of the American Dental Association. Dr. Paffenbarger was elected in May, 1929, as Dr. Taylor's assistant, and succeeded him after his resignation effective as of Nov. 1, 1931. The present Bureau of Standards Committee consists of Roscoe H. Volland, Harry E. Kelsey and Clinton T. Messner.

In the January, 1934, issue of THE JOURNAL, Dr. Souder presents an interesting and complete résumé of "Fifteen Years of Dental Research at the National Bureau of Standards," closing with the following summary:

Fifteen years of dental research has given:

1. Precision methods and equipment for measuring the physical properties of dental materials.
2. Discoveries and precision values such as (a) thermal expansion of teeth and amalgam, (b) effects of overtrituration of amalgam, (c) casting shrinkage of gold alloys and (d) accurate data on practically all restorative materials.
3. Explanation and coordination of research laboratory data in the language of their dental application.
4. Technics built step by step on accessory materials of known properties, using data in a scientific manner.
5. Specifications for most restorative materials.
6. Improved materials with quality up to standard.
7. New and pertinent laboratory exercises for the dental school.
8. Greatly improved dental restorations at no increase in cost, and in some instances at lower cost.
9. Favorable recognition of the work by many foreign countries.

### VARIABLES IN LABORATORY FINDINGS AND CLINICAL APPLICATION

Laboratory findings and technics are frequently at variance with their clinical application, and, to fully overcome or harmonize such variables, large groups of collaborators were selected to verify clinically or disapprove these. Such groups were chosen with careful consideration to their special qualifications and experience with the materials under investigation. Frequently, these were selected that they might function as groups or study clubs. These collaborators have been personally benefited, and thus have been encouraged to interest their colleagues, and to further study these and other problems, as well as to disseminate the knowledge acquired by presenting clinics and papers.

### APPROVED SPECIFICATIONS

It is quite generally recognized that the benefits accruing from this cooperative program at the Bureau and Standards has appealed to a much larger percentage of our members than most of the biologic research, important as that has been. During the progress of this work, certain specifications have been formulated and officially adopted by the House of Delegates as the specifications of the American Dental Association regarding: 1. Amalgam alloy. 2. Inlay casting investment. 3. Impression compound. 4. Inlay wax. 5. Inlay casting gold. 6. Dental mercury. 7. Wrought gold wire. The tentative specification for cements has been prepared and no doubt will be submitted for final approval by the commission and the House of Delegates at the St. Paul meeting.

Prior to submitting specifications of dental materials to the House of Delegates for final approval, it is the policy to submit them to the manufacturers for such criticisms or suggestions as they desire to present. This consideration and an expressed willingness to render assistance in improving dental materials and technics have been distinct factors in overcoming the opposition of many of the manufacturers and others when this program was first inaugurated. Consequently, a very general spirit of cooperation prevails at this time on the part of most of the former critics. Also, since the inauguration of the cooperative research at the Bureau, the dental manufacturers have greatly increased their appreciation of basic research, as an essential in producing and distributing many of their special items.

As a concrete example, one manufacturer has just constructed and equipped a $65,000 addition to their plant, 90 per cent of which is to be used in their research activities. This company employs

a staff of seven research workers, as compared to only one ten years ago. It was my privilege recently to inspect their research facilities, and I am pleased to report that they frankly admit that the program of the American Dental Association, especially the cooperative one at the Bureau of Standards, was a very positive factor in stimulating them to both improve and standardize their products. Furthermore, they recognize the need for maintaining standards after they have been established. Also, it is a well-known fact that other manufacturers have greatly extended their research facilities. The end-results of all this will be beneficial to the manufacturers and the profession. In the last analysis, the greatest benefit will accrue to the public.

## SOME PROBLEMS NOT SATISFACTORILY SOLVED

It has been claimed by a few that some of the money expended by the Research Commission has not produced a 100 per cent return. This will be readily admitted by its most enthusiastic supporters, but the same objection can be registered against practically every research undertaking. On the other hand, some of the grants made during certain years were not recommended by the executive board, but resulted from a stimulated propaganda influencing those having final jurisdiction. Irrespective of some errors of commission and omission, the result of the research activities of organized dentistry, during the past twenty-one years, has been a decided factor in the advancement of dentistry, and we trust this historical review will clearly demonstrate this to all of those who may have heretofore been apathetic or critical.

## PUBLISHED REPORTS AND PAPERS

Unfortunately, it is not possible to include a full list of the published reports and papers of the activities emanating from the Research Commission. It is hoped that the recommendation hereinbefore made will be approved and that these valuable data will be appended. As noted, the activities at the Bureau of Standards were only inaugurated April 1, 1928, and, since then, more than 600 pages of reports and papers relating to this cooperative program have been published.

609 Hartman Building.

# DEVELOPMENT OF DENTIN SCLEROSIS*

By THEODORE B. BEUST, D.D.S., M.D., Louisville, Ky.

VISIBLE sclerosis of small isolated areas of the dentin commonly becomes evident after the period of adolescence. Indication of beginning changes may rarely be seen as early as the time of tooth eruption. The exact nature of the modification occurring in the dentin has not yet been accurately determined. A hypercalcification, possibly combined with a keratinization, appears to occur. The result of the process is a sclerosis of the dentin matrix substance, followed by a similar modification of the organic content of the tubules.

Sclerosis ultimately results in obliteration of the tubules; which hinders the passage of metabolic fluids. Observations indicate that it also precludes the entrance of the agents that cause caries. Sclerosis has, therefore, a marked influence on the behavior of the tooth in respect to its environment. Experiments have indicated that resistance of the tooth to caries and trauma increases in proportion to the amount of sclerosis.

Physiologically, two types of sclerosis may be conveniently differentiated. An irritation sclerosis is a reaction to such trauma as abrasion, erosion or the presence of congenital or traumatic enamel defects and caries. A spontaneous sclerosis occurs without visible cause in teeth that are perfect in form and function; or from age changes, such as the maturation process. This may lead to complete hypercalcification of the tubules of the crown and root and finally to calcification of the pulp.

Anatomically, two forms of sclerosis may be distinguished. An opaque form, marked by a predominance of opaque tubules, is the most common. A transparent form, marked by a relative freedom of opaque tubules, may be an advanced stage of the former. Specimens partaking of the characteristics of both may be conveniently described as mixed. These forms have been considered in recent publications.

As the tubules and matrix substance in sclerosed areas are impervious to stains, the condition can conveniently be demonstrated by subjecting whole or halved teeth or ground sections to an intensive staining process. Dentin with normal open tubules is permeable. Such dentin is chromophilic. Sclerosed dentin, on the other hand, is not colorable by ordinary means and is therefore designated as chromophobic.

To demonstrate the various degrees of sclerosis in a stained ground section to an audience would require three photographs, one of which must be made by transmitted and two by reflected light. For practical purposes, the major amount of sclerosed tissue found in a section or halved tooth may be shown in one reflected light photograph taken

*Work supported in part by a grant from the Research Commission of the American Dental Association.

*From the Research Laboratory of the School of Dentistry, University of Louisville.

*Read before the Section on Histology, Physiology, Pathology, Bacteriology and Chemistry (Research) at the Seventy-Sixth Annual Session of the American Dental Association, St. Paul, Minn., Aug. 8, 1934.

over a dark background. This is possible because the so-called transparent zones under areas of abrasion and caries contain opaque tubules sufficient in number to cause these areas to appear white when observed by reflected light, as shown in the accompanying figure.

During these investigations, seventy

**Fig. 1.—Tooth showing sclerotic reaction zones under abrasion at apex of crown and under morsal and cervical caries. Spontaneous sclerosis is seen under sound enamel, lingually, near the gingival border.**

halved, functionally intact teeth of unknown history were first examined. These showed various degrees of macroscopically visible sclerosis in 92 per cent of the specimens. In another experiment, of 110 halved teeth with cavities involving the pulp, only 15 per cent exhibited macroscopic evidence of sclerosis. The discrepancies here shown reveal a relationship between sclerosis and the incidence of caries. The large number of teeth examined in these experiments appear to provide an accurate cross-section of existing conditions. It must be understood that the results shown represent the sclerosis visible in longitudinal medial sagittal sections of incisors, cuspids and molars, and in transverse sections of bicuspids. The figures published would undergo slight modification if more sclerosed tissue were revealed by further dissection.

The fact that the incidence of caries decreases at a time of life in which sclerosis is most active is significant.

Heretofore, my observations were made on clinical material of unknown history. Today, with the assistance of Edward H. Hubbuch, of the School of Dentistry, University of Louisville, it is possible to present data corroborating the views earlier expressed in this research.

It has been pointed out that sclerosis may begin very early in life and that its presence becomes increasingly conspicuous with advancing years. In the report now to be submitted, thirty-nine teeth removed from persons, aged 40 to 85 years, were subjected to the routine technic and judged by the standards earlier applied. The findings were as follows:

1. The crowns and roots of a bicuspid and two cuspids, in a person aged 85, proved to be practically completely sclerosed.

2. One of two lower central incisors, in a patient aged 70, was completely sclerosed, the other exhibiting only slight penetration.

3. The crowns of a lateral incisor and a cuspid, from a patient aged 56 (paradentosis), were completely sclerosed.

4. With three exceptions, sclerosed tissue occupied from one-half to three-fourths of the crowns of all remaining teeth of subjects of 50 years or over.

The exceptions noted consisted of a third molar (patient, aged 65) and a lateral incisor (patient, aged 60), which displayed very slight amounts of sclerosis; while a third molar (patient, aged 55) was permeable throughout.

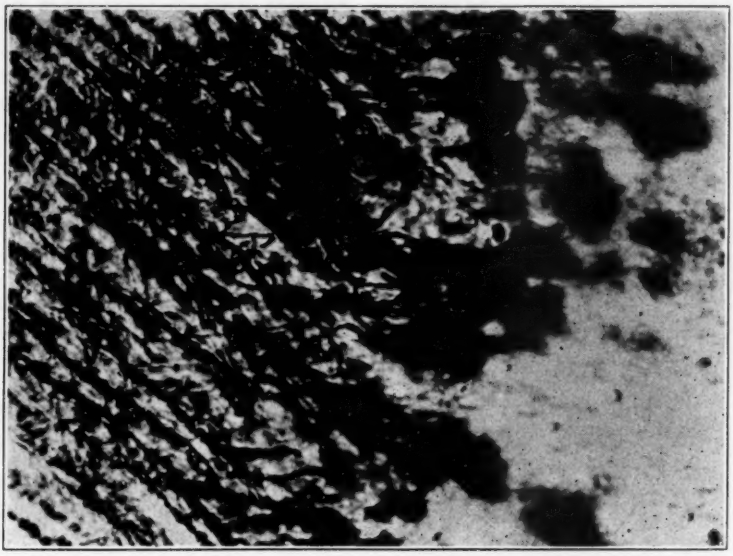

Fig. 2.—Section in which stain has diffused into ground substance surrounding elements of granular layer.

This experiment showed that 92 per cent of the teeth examined were wholly or largely sclerotic. Adding the two teeth which exhibited a minimal amount of sclerosis would bring the percentage of completely or partially sclerosed teeth to 98.

Staining experiments have shown that newly erupted teeth are almost universally permeable and furthermore that teeth of subjects of advanced age are commonly sclerosed and impermeable. They also show that some teeth of persons past late maturity are not sclerosed. To these findings, two more facts should be added: It is known that teeth suddenly become caries-susceptible after displaying a remarkable resistance to caries for long periods. It is also known that the dentin of teeth that have succumbed to rapid decay is permeable. If these several facts are correlated, certain theoretical assumptions appear permissible. It may be that the permeable adult tooth is either an abnormal hypoplastic tooth or a normal tooth that has been depleted of its physiologic mineral content by catabolic processes. Certain facts point to the latter assumption. It is well known that inorganic constituents of the osseous system may be removed; also,

that deficient diets may result in hypoplasia of the dentin. The removal of mineral elements from formed calcified dental tissues has never been demonstrated microscopically. Phenomena will now be discussed that appear to suggest an interpretation of this nature.

If a number of intensively stained erupted teeth of youthful persons are subjected to a comparison with chromophilic carious teeth of adults, certain differences may be noted. Relatively low power inspection of the outer regions of the dentin of the teeth of youth reveals permeability of the tubules, with absence of or only negligible colorability of the matrix substance. Under high power, the tubules, intertubular processes, spindles and spaces of the granular layer are found, in accordance with their maturation, to be stained and sharply demarcated. These findings are at variance with the appearance displayed by decayed chromophilic adult teeth. Here, the matrix substance, on low power inspection, appears clouded. Increased magnification reveals deeply stained intertubular processes. These are so much in evidence that the matrix substance appears intermingled with colored wool. Under high power, the tubules appear larger than normal and may be appropriately characterized, owing to the profusion of visible processes, as "fuzzy." The most conspicuous deviations are found in the granular layer. The spaces are here also intensively stained, but may differ from those of youth in that the surrounding tissue exhibits an unmistakable penetration by the coloring fluid, giving the impression that inorganic constituents have been removed from the matrix substance. This diffusion into the surrounding ground substance is so marked that, in many cases, the sharply defined spaces found in normal teeth have given place to indefinable blots at the end of the tubules. (Fig. 2.)

The phenomena here described appear to justify the assumption of a possible catabolism. They also contribute to our knowledge of the significance of the granular layer, which has heretofore been regarded as a region of faulty calcification. If this presentation receives further substantiation, the granular spaces would automatically be ranked with the nutritive apparatus of the tooth.

During the last three years, much time has been spent in establishing the contentions early advanced by me that physiologic changes occur in the calcified tooth tissues. Today, the occurrence of biologic phenomena must be admitted without cavil. Contrary assumptions, in order to be consistent, would necessarily regard upwards of 90 per cent of noncarious teeth as pathologic.

# OSTEOMYELITIS OF THE MANDIBLE*

By THOMAS CONNER, D.D.S., Atlanta, Ga.

IN nearly all cases of osteomyelitis, a tooth has been extracted a short time before or is extracted just after the onset of the disease; therefore, the tooth is at the head of the list when the possible causes of the infection are named. To extract or not to extract is a question that should receive most careful consideration.

It has been my usual practice for years to extract teeth with acute apical abscesses under local or general anesthesia, preferably nitrous oxide-oxygen, and I expect to continue this practice because the results justify my doing so. It is an effective method of establishing direct drainage for infected periapical tissue.

It has also been the usual practice in my office for many years not to extract a tooth when its removal does not facilitate drainage of the area infected. The lower third molar comes under this rule very frequently; also, cases of marked edema. We must use judgment, founded upon past failures and successes, to determine the best procedure in each individual case.

Even though we exercise sound judgment, based on past failures and successes, the lack of cooperation on the part of the patient may bring about an undesired condition. Many patients, especially men, will not follow instructions or will procrastinate before the work is done; which may be one reason that more men than women have osteomyelitis. This case is a good example:

Mr. M., aged 40, was referred, Sept. 23, 1925, for extraction of the lower right second molar. He had been suffering severe toothache for several days and the tooth had not responded to treatment. It was extracted under procaine conduction anesthesia without difficulty. Routine instructions were given.

October 4, the eleventh day after extraction, the patient's wife called me and said that her husband was in bad condition. I called to see him at his residence and found him suffering from osteomyelitis of the mandible extending from the region of the right first molar to that of the left cuspid. Pus was draining freely from around each tooth. The patient was not suffering, but was very indifferent, this state of mind being acquired and constantly maintained by consuming a quart of whiskey each day. Apparently, he was enjoying poor health. He was hospitalized and received the usual treatment of internal and external drainage until a sequestrum and involucrum formed. The patient was dismissed from the hospital, October 8. Pus drained freely and continued to do so until Jan. 5, 1926. On this date, all remaining sequestra were removed intra-orally, including the lower border of the mandible, while the patient was under the influence of his special brand of Georgia corn anesthesia—a much quieter patient than when we gave him gas-ether to establish drainage, October 5.

I have extracted hundreds of such teeth and this is the only case of osteomyelitis to develop. I believe that if this patient had followed instructions, i.e., "Place ice bag on side of face for twelve hours, drink plenty of water and fruit

*Read before the Section on Oral Surgery, Exodontia and Anesthesia at the Seventy-Sixth Annual Session of the American Dental Association, St. Paul, Minn., Aug. 8, 1934.

juice, take laxative in the morning, rest in bed tomorrow in case of fever or very much swelling, call me in case of trouble," such complications would not have developed. In cases of acute infection of the oral cavity, rest in bed is essential. I wish some of our prolific writers would read us a paper at our next meeting on its importance. I believe complications developed in this case because of utter disregard of my instructions and the extreme abuse that the patient's whole physical make-up was subjected to during a ten-day drunk. This is, of course, a personal opinion and, under the circumstances, may be biased.

A large percentage of patients suffering from osteomyelitis of the mandible get well and the physical defects can be corrected by plastic surgery and dental restoration to such a degree that the patient can serve society as though nothing had happened. But the charges and countercharges that frequently arise when the origin of the infection is named are kept burning as long as the patient may live.

Not so long ago, a patient came in for an oral examination. Most of his upper teeth were present and in very good condition. All the lower teeth had long since been extracted. When I asked him how he happened to lose the lower teeth, he went into a tirade. He later apologized for losing his temper, explaining that he was not cursing me, but a dentist who had extracted a tooth for him many years ago and was credited with infecting the bone. Perhaps the removal of the tooth did cause the osteomyelitis, but it is quite possible that he would have developed the osteomyelitis had the tooth not been extracted. A surgeon could have rendered this patient a life long service had he stated the fact that there are thousands of abscessed teeth extracted with no complications, and that, on the other hand, there are many leg bones, arm bones and jaw bones that necrose every year from unknown causes.

Most cases of osteomyelitis that I see are more or less chronic and have been treated by several dentists and a surgeon or two. The patient usually has a disgruntled expression because he blames one or more of them for all his trouble. A rusty needle or an unsterilized instrument was used, or the wrong tooth was extracted; etc., etc. As I dislike to work for a patient in this frame of mind, my first move is to change his attitude of mind, if possible. I ask a few questions, varying them, of course, according to developments. Many of such conversations follow this general outline:

"How long have you had this trouble?"

"Ever since Dr. Blank pulled my tooth and infected the jaw-bone."

"Did he extract your tooth on the first visit?"

"No; he could not tell which one was hurting."

"Did the pain keep getting worse?"

"Yes."

"Did you go to your dentist the next day and tell him which tooth was aching and ask him to pull it out because you could not stand the pain?"

"Yes."

"If you had had just an old-fashioned abscessed tooth extracted, the pain should have subsided in a few hours. The infected bone, and not the tooth, was probably causing the pain. I have seen several patients who had even a worse infection than you have who had no tooth extracted. Did the same dentist extract the other missing teeth?"

"No, I went to another one."

Dentist No. 2, in his eagerness to comfort a sick patient, agrees that things might have been different if the tooth had been treated thus and so. He does not realize it, but his conversation has

incriminated a fellow practitioner who probably deserved defending. The remarks that are made under such a condition often are seed that grow into a malpractice suit.

Dentist No. 2 extracts an elongated loose tooth that is particularly annoying when the patient closes his mouth; keeps him under observation for a day or so; realizes the seriousness of the case, and chooses to refer him to an oral surgeon. The oral surgeon, recognizing the condition at a glance, informs the patient as to just what will have to be done, stating that months may be required for complete recovery. A history is taken. Is it worth anything? Yes, it is invaluable if true and accurately related, but if biased, as many of them are, it is an injustice to all. You cannot criticize the patient for blaming physical defects or systemic disorders on some outside influence rather than on some lack of proper internal functions. So the professional man, especially one of little prominence, who treats a serious, long-drawn-out disease in its early stages is frequently blamed by the patient for all complications. I am of the opinion that certain oral surgeons accept the case history as true without even asking corroboration by the first doctor on the case. This is not only hard on the doctor who has been condemned without a hearing, but especially so on professional men all over the world who govern their practice more or less according to what "they read in the papers."

Mr. W., aged 42, on the night of Aug. 21, 1924, developed an indefinite unlocalized pain on the right side of the face. As it was a little better the next morning, he went to work. In the afternoon, as it became worse, he went to a dentist to have the tooth "fixed." The one causing the pain could not be located, because all the teeth were apparently normal, except for a small occlusal cavity in the upper left third molar. This, in a groping process of elimination, was extracted. The procaine anesthesia did not relieve the pain and the extraction had no effect on it. The patient was referred to me, August 23, twenty-four hours after the tooth had been extracted. He was hospitalized immediately, as he apparently had an osteomyelitis of the entire mandible, also one of the most extensive infections of the soft tissue that I have ever seen. (In all such cases, I prefer to have a general surgeon on the case with me to look after the extra-oral infection and prescribe systemic treatment while I take care of the oral cavity.) The mandible necrosed from condyle to condyle. The usual treatment of drainage and waiting for a sequestrum and involucrum to form was adopted. The patient was dismissed from hospital, September 20, with pus still flowing freely internally and externally, and, before he recovered, I thought it was going to be eternally.

This patient, like all others when in severe pain, had insisted that something be done *now,* and this case, as many others, emphasizes the fact most forcibly that we should never operate unless there is a definite reason for so doing. It is much better to quiet the patient with narcotics, frequent visits and much personal interest until a diagnosis can be made.

After studying the history of the case very thoroughly, the surgeon, the patient and I all agreed that the infection had not come from the presence of or removal of the upper third molar. In fact, the patient actually bemoaned the fact that he had persuaded the dentist to extract a tooth that he could have saved. And yet the patient's account of the case when he was readmitted to the hospital, Aug. 16, 1925, for final sequestrectomy, reads: "Present condition dates back about one year, following extraction of tooth." The surgeon and I were quite positive that the extracted tooth played no part in causing the osteomyelitis or cellulitis, and yet the patient, in giving the history a

second time, felt obliged to give the interne some reason for the infection and so named the extraction of the molar tooth as the cause of the condition. I might add by way of parenthesis that patients suffering from osteomyelitis are not the only ones who give biased histories. Parents whose children are afflicted by some inherited mental unbalance often attribute the trouble to a trivial fall. In this case, had the history been given to a surgeon not familiar with the original findings, he probably would have handed the record to his statistician with instructions to add the case to the list of cases of osteomyelitis following extraction of a tooth.

In numerous cases, a certain tooth was extracted because the patient thought it was causing early paroxysms of tic douloureux. And the same patient, who, if his regular dentist refused, virtually forced another dentist to extract the tooth, will, when the pains become almost unbearable, go to another dentist or physician and give him a history of how this awful pain started when Dr. Blank pulled a tooth.

In my opinion, many of the histories of osteomyelitis of the mandible reported as true would be just as ridiculous as these, if verified. Let the patient have his alibis, but it is far better for the profession for us to report "Cause unknown," than to make a diagnosis from a questionable history.

# FUNDAMENTAL PRINCIPLES IN THE CORRECTION OF OCCLUSAL DISHARMONY, NATURAL AND ARTIFICIAL*

By CLYDE H. SCHUYLER, D.D.S., New York City

AUTHORITIES in all branches of dentistry are united in the recognition of abnormal or excessive stress as a primary cause of disease and destruction of tissues supporting teeth, natural or artificial.

The necessity of "balanced occlusion" or distribution of occlusal stress over the greatest possible supporting area has for many years been emphasized by both prosthodontists and periodontists. More recently, the undesirability of steep guiding cusp inclines has been stressed.

While the necessity of occlusal harmony has been emphasized, a definite procedure in accomplishing this has not been sufficiently outlined. Grinding of both natural and artificial teeth has been done by most operators in a ruthless, haphazard manner. Some have advocated the use of abrasive pastes as the most desirable means of creating occlusal harmony.

These procedures have resulted in reduced sharpness of cutting cusps, elimination of food exits and increase in contact surfaces; all of which render the teeth less efficient in function and necessitate the application of excessive forces.

The milling away of supporting cusp points permits a closing of the maxillomandibular relation and may result in an uneven distribution of stress in either centric or eccentric occlusal positions. The

*Read before the Section on Full Denture Prosthesis at the Seventy-Sixth Annual Session of the American Dental Association, St. Paul, Minn., Aug. 8, 1934.

elimination of eccentric occlusal interference by removal of a supporting point rather than the reduction of a guiding cusp incline may disocclude the tooth in centric or other eccentric positions, resulting in reduced efficiency. This indefinite procedure in the correction of the occlusion of the natural dentition may produce not only these undesirable results, but also an uneven distribution of stress in centric or eccentric positions, wedging of the teeth due to stresses placed upon tooth inclines and subsequent exfoliation, with recurrent cusp interference and an accentuated periodontal disturbance.

As increased discomfort rather than relief often resulted from these haphazard procedures, criticism could justly be ex-

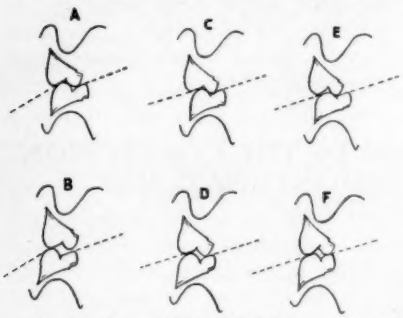


Fig. 1.—*A*, proximal view of two molars in normal relation to supporting ridges. The two guiding inclines are not parallel. *B*, teeth in lateral relation, only one cutting cusp, the lower buccal, making contact. A portion of the triturating efficiency is lost. Stresses are unfavorably placed toward the buccal aspect of the supporting tissues. If only one cusp were in contact, the lingual cusp would be preferable, as this contact would stabilize the dentures. *C*, upper buccoclusal incline corrected and now parallel to linguoclusal incline of lower tooth. *D*, lingual cusp point of upper tooth and buccal cusp point of lower tooth making contact with opposing guiding inclines in eccentric position. These cusp points in a well-defined tooth function as cutting blades against the opposing tooth surface as a chopping block. Their sharpness should be retained. These points also maintain the maxillomandibular opening. *E*, *F*, premature buccal contact in eccentric position relieved by grinding wrong tooth surface, lower buccal cusp having been taken out of contact in centric position and portion of eccentric position.

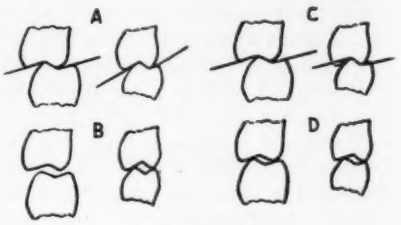


Fig. 2.—*A*, bicuspid and molar on same side of arch, guiding inclines of which are not in harmony. *B*, eccentric relation, bicuspids in premature contact and molars out of function. *C*, areas of bicuspids that should be ground, buccoclusal incline of upper tooth and linguoclusal incline of lower tooth. Distribution of stress in the centric position and the sharpness of the cutting cusps is retained. *D*, distribution of stress and maximum function in eccentric position. *E*, effect of improper grinding of tooth surfaces, lower buccal and upper lingual cusp points. As shown in *F*, premature contact in the lateral relation is eliminated, but the tooth is taken out of contact and function in the centric and a portion of the eccentric position. In the artificial dentures, this might produce only impaired function. In the natural dentition, it might mean reduced distribution of stress, wedging of teeth on contacting inclines and subsequent exfoliation, with a return to premature contact in the eccentric position. If done throughout the dentition, a closing of the maxillomandibular relation is associated with a wedging of the teeth in the centric position and a lack of relief in the eccentric positions. Cutting cusp points are rendered flat and inefficient, contact surfaces increased and food exits decreased.

pected, and, after experiencing unfavorable results, many practitioners refused to attempt treatment, or undertook emergency treatment with great temerity. Preventive procedures have been quite universally neglected. Thus, this widespread prejudice has resulted in the minimizing of a most important service to those dependent on us.

The correction of occlusal disharmony, natural or artificial, must be accomplished by spot grinding definite tooth surfaces. Only by a systematic procedure will the following ideals be attained:

1. Maximum distribution of stress in centric maxillomandibular relation.
2. Retention of the maxillomandibular opening.
3. Harmony of guiding inclines, thereby distributing eccentric occlusal stresses.
4. Reduction of the incline of guiding tooth surfaces, that occlusal stresses may be more favorably applied to the supporting tissues.
5. Retention of sharpness of cutting cusps.
6. Increase of food exits.
7. Decrease of contact surfaces.

Our goal must be the reduction of essential forces applied in the act of mastication and the distribution of such forces in a manner favorable to the supporting tissues.

The teeth can readily be divided into cutting surfaces or points, and planes on which these surfaces or points function. (Figs. 1-2.) In normal occlusion, the incisal surface of the lower six anterior teeth functions as the cutting instrument against the lingual incline of the upper anterior teeth. The act of incision is accomplished in any position of contact, from the normal centric relation to the protrusive edge to edge bite; or it may be accomplished by the shearing effect of the lower incisors on the lingual incline of the opposing upper teeth, as the mandible moves from the eccentric to the centric relationship.

During the masticatory stroke, the lower buccal cusp functions as a cutting instrument on the buccoclusal incline of the opposing upper tooth. These cusps function, figuratively speaking, as cutting blades on the opposing tooth surfaces, which act as chopping blocks. In the same manner, the upper lingual cusp functions on the linguoclusal incline of the opposing lower tooth. As long as the sharpness of the cutting instrument is retained, limited changes may be made in the incline of the surface on which it functions, without impaired efficiency in function. Unfortunately, wear reduces the cutting efficiency of these cusps and they function more and more as mashers, an additional application of force being required in function.

Examples of the guiding inclines mentioned are the lingual inclination of the upper anterior teeth, the buccoclusal inclination of the upper posterior teeth and the linguoclusal inclination of the lower posterior teeth, which must be parallel or in harmony to maintain an even distribution of stress, as the mandible passes in function from the lateral to the centric occlusal position. A separate series of inclines control the movement in the right lateral, left lateral and protrusive excursion.

The term "parallel" or "in harmony" is used, as these planes may be in functional harmony and not parallel. If there is a steep anterior overbite, these guiding inclines will be progressively flatter, passing from the anterior to the posterior teeth; while, with a flat incisal guidance, posterior inclines will be progressively steeper. The buccoclusal inclination of the upper tooth will be parallel to the linguoclusal inclination of the opposing lower tooth.

The same cutting surfaces or cusps, as

mentioned, retain the maxillomandibular opening in the centric maxillomandibular position, the upper lingual cusps resting in the central fossae of the opposing lower bicuspids and molars, and the buccal cusps of the lower teeth resting in the central fossae of the opposing upper bicuspids and molars. In the artificial denture, distribution of stress over the maximum area does not necessitate contact of the anterior teeth in the centric maxillomandibular relation; while, in the natural denture, this contact is essential to the maximum distribution of stress and may be a necessity in obtaining a physiologic distribution. Thus, the retention of the maxillomandibular opening and, in the natural dentition, the maximum distribution of stress in the centric maxillomandibular position, depends on the retention of these cusps or surfaces.

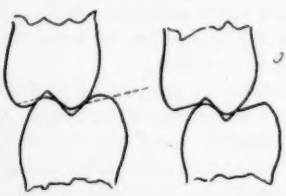

Fig. 3.—Possible changes in lateral guiding inclines reducing horizontal stress in lateral eccentric positions. The upper lingual cusp and the lower buccal cusp maintain the maxillomandibular opening and serve as the cutting instrument in the trituration of food.

Harmony of occlusion must be first established in the centric maxillomandibular position. Premature contact in centric relation can be relieved in one of two ways: by grinding the cusp points or surfaces mentioned, that is, the upper lingual cusp, lower buccal cusp and the incisal edges of the lower anterior teeth; or by grinding the surfaces which these points prematurely make contact with. The selection is not optional. The requirements of the individual case dictate the selection. If the supporting point (upper lingual, lower buccal or lower incisal) is in premature contact in the centric and eccentric positions, the interfering point or incisal edge should be moved. Should premature contact exist

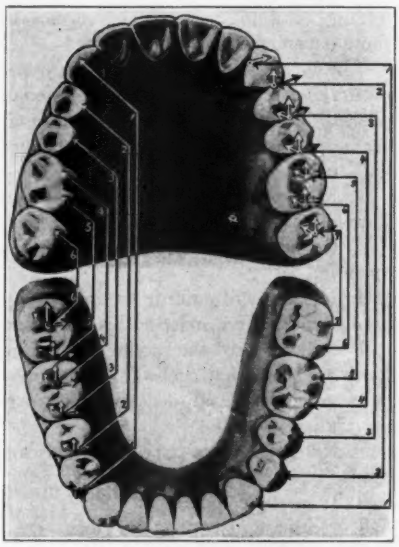

Fig. 4.—Position of upper lingual and lower buccal cusp points in centric occlusal position. The arrows indicate the movement of the cusp points in the eccentric (functional lateral, protrusive and balance) position. If the prominence of these cusp points is retained, the maxillomandibular opening is maintained. If the point is in physiologic contact in the centric position, but premature contact in any of the eccentric positions, correction must not be made by grinding the point, but the occluding plane, the incline of which is too steep. Should premature contact exist in the centric position with proper contact in the eccentric positions, premature contact in the centric position should be relieved by increasing the depth of the fossae. Should premature contact exist in centric and all eccentric positions, the point or cusp should be ground. A reduction of the cusp point increases contact surfaces; a reduction of the inclines decreases contact surfaces and opens food exits.

only in the centric position, the opposing surface should be ground. Should the improper procedure be adopted in the first instance, unnecessary tooth mutilation is necessary to relieve premature contact in the eccentric positions. Should the improper procedure be adopted in the second instance, the point will be taken out of contact and function in the eccentric positions. This in the artificial denture might increase the problem of securing cusp contact on the balancing side, or might produce only loss of efficiency in the trituration of food, as a distribution of stress to the supporting tissues might be maintained in the centric or eccentric relation, even though several teeth were out of contact, it being possible to maintain this distribution by three widely separated points of contact. In the natural dentition, a tooth out of contact in any position means not only loss of efficiency, but also added function upon the other teeth and may be a contributing factor to disease.

In the correction of occlusal disharmony in the eccentric positions, the upper lingual cusp and the lower buccal cusp and, in the natural dentition, the lower incisal edges should not be ground. As we have previously mentioned, these points maintain the maxillomandibular opening and maintain distribution of stress in the centric relation, and as they are the cutting surfaces in the function of mastication or incision, the retention of their sharpness is essential, both for cutting efficiency in function and as a means of minimizing the essential application of force.

Fig. 5.—Lateral view of cuspids and two posterior teeth on same side of arch. The cuspids would be in premature contact in the lateral relation as the lateral guiding inclines are not in harmony. In the natural dentition, the shaded portion of the upper tooth should be removed. Contact of the cuspids is retained in the centric position and harmony of guiding inclines and distribution of stress in the eccentric position established. The removal of the dotted area of the lower cuspid would eliminate premature contact in the lateral position, but would take the cuspids out of contact in the centric and a portion of the eccentric relation, placing an undesirable burden on the posterior teeth. If the lower tooth were ground, either a closing of the bite or exfoliation might restore contact in the centric position, at which time the teeth would again be in premature contact in the eccentric position. Any of the six anterior teeth may be in premature contact in lateral positions and require the same consideration. Contact of the anterior teeth of full artificial dentures in the centric position is not essential to the maximum distribution of stress.

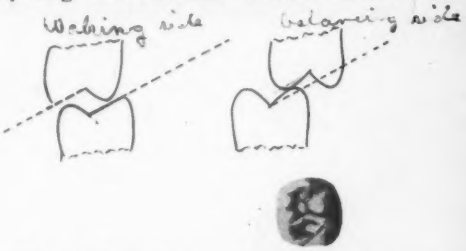

Fig. 6.—Premature contact on balancing side harmony secured by grinding through areas indicated by dotted lines on the lower tooth. This seldom affects the lower buccal cusp points. The grinding of the upper lingual cusp point removes it from contact in centric and other eccentric positions.

At this time, that is, after harmony has been established in the centric position, premature contact in an eccentric position is not due to the prominence of these points, but to disharmony of guiding inclines on the opposing tooth surface. (Fig. 4.) If occlusal harmony exists in the centric position and similar guid-

ing inclines are parallel or in harmony, there must be harmony of occlusion and even distribution of stress in all eccentric positions. Therefore, after harmony is established in the centric maxillomandibular relation, all tooth grinding done to relieve premature contact in all eccentric positions, either lateral or protrusive, must be done upon surfaces previously designated as guiding planes. An exception may be made of the anterior teeth in artificial dentures. As previously mentioned, the contact of these teeth in the centric occlusal position is not essential to the maximum distribution of stress to the supporting tissues. Anterior contact in the centric relation is always desirable

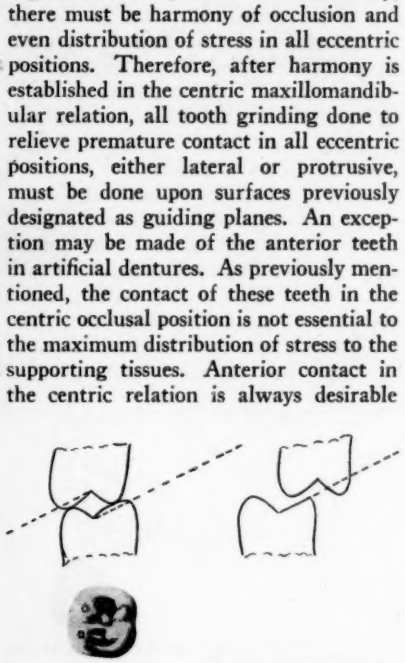

Fig. 7.—Lack of contact on balancing incline. Guiding inclines on the working side are more acute than the balancing incline. Contact on the balancing side might be secured by reducing inclines on the working side, establishing harmony of similar guiding inclines.

and usually essential in the natural dentition. (Fig. 5.)

Should it be desirable, owing to their excessive function, to permit the natural anterior teeth a period of rest, this should be accomplished in a definite manner: First, premature contact in the centric relation should be relieved by grinding the lower incisors, normal contact remaining. After this, premature contact is eliminated in both lateral and protrusive positions by grinding the guiding inclines of the upper teeth and establishing harmony between these inclines and similar guiding inclines of the other teeth. Rest, then, in both the centric and the eccentric positions, may be accomplished by again grinding the incisal edge of the lower teeth, eliminating contact. After a short period, slight exfoliation may restore contact in the centric position, at which time there will be harmony in the eccentric, as this was secured before the teeth were taken out of contact. When the lower anterior teeth are taken out of contact before occlusal harmony is established in eccentric positions, there remains no possibility of establishing harmony between the lingual inclines of upper anterior teeth and similar guiding inclines on the posterior teeth. As long as the relation of the anterior teeth remained constant, no ill-effects would result to these teeth by improperly removing them from contact. Should these teeth exfoliate until contact is restored in the centric position, premature contact in eccentric positions would develop progressively with the exfoliation.

In the study of occlusion, on the balancing side, the upper lingual cusp is the contacting point which glides along the buccoclusal incline of the lower tooth. This balancing inclined plane must be in harmony with the working planes on the opposite side of the arch. If premature contact exists on the balancing side, it is because the guiding incline is too steep as related to the working inclines on the opposite side of the arch. (Fig. 6.) Correction is made by reducing the steepness of the guiding incline, not the upper lingual cusp. Thus, contact of the lingual cusp is retained in the centric position, the maxillomandibular opening and the distribution of stress thereby being maintained, while harmony is produced in the eccentric position.

Should there be a lack of contact on the balancing side, it is because the bal-

ancing incline has insufficient inclination as compared to the working incline on the opposite side of the arch. If within reasonable limitations, balance may be secured by reducing the incline of the planes on the working side. (Fig. 7.)

Disease and destruction of supporting tissues are now commonly recognized as sequelae of excessive inclination of guiding inclines, in both the natural and the artificial tooth. Sharpness of cutting cusps minimizes the essential application of force in function and reduces the possibility of trauma. By the procedure outlined, undesirable guiding tooth inclines may be reduced, while cusp sharpness is retained, the same cusps definitely maintaining the maxillomandibular opening in centric maxillomandibular relation.

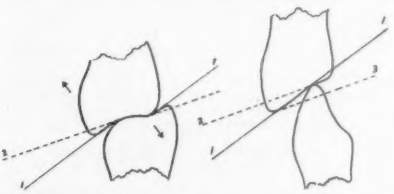

Fig. 8.—Advanced tooth wear associated with steep anterior tooth guidance. Lateral stress on the posterior teeth may be reduced by reducing the buccal incline of the upper tooth and the lingual incline of the lower tooth. This necessitates the reduction of similar inclines on all anterior teeth. That is the lingual incline of the upper teeth. The removal of the incisal edge of the lower teeth places an added burden of centric occlusal stress and much of the eccentric occlusal stress on the weak posterior teeth. Premature contact of the anterior teeth would develop progressively with either a closing of the maxillomandibular relation or an exfoliation of the anterior teeth, as harmony had not been established between similar guiding inclines.

As a routine procedure, I construct all full artificial dentures with little or no vertical overbite, making it possible to reduce the guiding inclines on the working side to approximately the horizontal, and greatly reduce protrusive and lateral balancing inclines. (Fig. 7.)

That nature builds bony structure to support the natural teeth in proportion to the demands placed on it has been emphasized by some. This does not appear con-

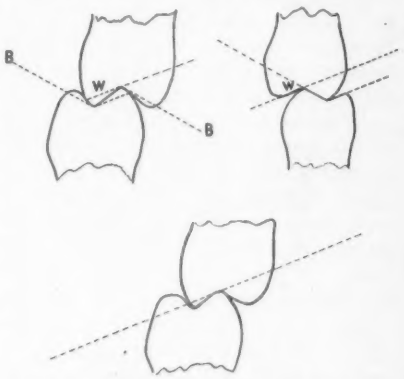


Fig. 9.—Proximal view of two molars and two bicuspids on right side of arch. The bicuspids are in normal relation and the molars in a "cross-bite" relation. In this relation, the upper buccal and lower lingual cusps of the molars maintain the maxillomandibular opening. The same cusps serve as cutting points. As the guiding inclines of the molars are steeper than similar inclines of the bicuspids, the molars would receive excessive occlusal stress in the eccentric positions. The upper buccal cusp may be ground along the surface indicated by *W;* which produces harmony with the similar guiding plane of the bicuspid. The lower lingual cusp will retain contact and distribution of stress in centric relation. In the lateral position, it functions as the cutting cusp and maintains the distribution of stress on surface *W*. If desired, the correction may be made by grinding the lower lingual cusp as indicated, retaining the prominence of the upper buccal cusp to distribute stress in the centric and eccentric positions. Both cusp points, upper buccal and lower lingual, must not be ground, as stability in centric occlusion would be destroyed, a possible wedging of the teeth, exfoliation and continued unequal distribution of stress resulting. Premature contact in the balancing position would be relieved by grinding inclines *B*, that is, the lower buccal and upper lingual cusps.

sistent. We recognize the fact that a limited amount of functional stimulation is conducive to tissue development. It is equally true that excessive functional stimulation is a factor in producing tissue destruction. Functional stimulation that is normal and conducive to tissue development today may become a destructive stimulation tomorrow, as tissue tolerance and regeneration are not consistent, varying with health and age.

Progressive tooth wear is often a factor in excessive stimulation of the supporting structures. Both tooth and condylar guidance are factors in natural tooth wear, the guidance of the anterior teeth being foremost in importance. The lateral incline of the glenoid fossae and the anterior tooth guidance are the controlling factors in the wear or inclination of the lateral guiding planes of the posterior teeth, on the working side. The anterior inclines of the glenoid fossae and anterior tooth guidance are the controlling factors in the wear or inclination of the balancing planes and anteroposterior guiding planes of these teeth.

An edge to edge incisal relation is conducive to flat occlusal wear on the posterior teeth. There is a greater freedom and range of lateral movement, and while the cutting cusp points become less efficient, lateral guiding inclines are being reduced. Thus, as additional force is essential in the trituration of food, stresses are applied more nearly vertically to the supporting tissues; which is favorable to the maintenance of tissue health.

The steep vertical overbite of the anterior teeth is conducive to a different form of tooth wear. As wear progresses, we find developing the long buccal cusp of the upper teeth and the long lingual cusp of the lower teeth; which places the functional stress toward the buccal aspect on the upper teeth and toward the lingual on the lower teeth, the lingual cusp of the upper teeth and the buccal cusp of the lower teeth receiving the greatest amount of wear. (Fig. 8.) In the one instance, with the flat incisal guidance, the center or axis of mandibular movement would be above the occlusal plane and tooth wear would conform more nearly to advanced spherical principles; while, with the extremely steep incisal guidance, a perpendicular to the two guiding inclines, incisal and condylar, would meet below the occlusal surface, this center of movement resulting in the unfavorable tooth wear.

Tooth wear controlled by a steep vertical incisal guidance is also less favorable to a bilateral distribution of stress. The wear of the upper lingual cusps and lower buccal cusps and the lower incisors is more rapid than the wear of opposing tooth surfaces. These have been referred to as the points functioning on the planes of the opposing tooth's surfaces as the mandible moves in eccentric positions. Friction between a point and a plane produces more rapid wear of the point than the plane on which it moves. These points may function on multiple planes. As an example, the upper lingual cusp of the molar may make contact with the linguoclusal incline of the lower molar in one lateral movement, the buccoclusal incline in the other or balancing lateral movement and the anterior incline in the protrusive movement.

As these points are worn away and the maxillomandibular opening is reduced, the vertical overbite of the anterior teeth may be increased with an increased steepness of anterior tooth guidance. As this guidance is the control to the wear of the working inclined surfaces of the posterior teeth, they become progressively steeper as wear progresses, while the balancing cusp point on the opposite side is becoming less prominent. While early in life this case might have

been favored with a bilateral distribution of stress in the eccentric position, wear has caused a progressive tendency toward a unilateral or limited distribution in this position.

I have mentioned the fallacy of correcting occlusion, either natural or artificial, with abrasive pastes. The correction of occlusal disharmony in the centric relation depends on the selection of either the tooth cusp or the opposing tooth surface, depending on the relation of the cusp to guiding planes in the eccentric positions. The reduction of disharmony in the eccentric positions necessitates the correction of guiding inclined planes, not supporting points. The reduction of undesirable tooth inclines necessitates the grinding of these inclines, not the opposing points. A definite tooth surface cannot be reduced by the use of abrasive paste. Planes are changed only slightly, while points are rapidly worn away. This produces the same undesirable condition as natural tooth wear, destroying in a few moments what normally would require years; that is, reduction of the maxillomandibular opening; dulling of the cutting surfaces; increase of the contact surfaces and reduction of the food exits.

It does not necessarily harmonize the guiding inclines, and may be a factor in an uneven distribution of stress in either the centric or the eccentric positions. In denture prosthesis, fine abrasive paste may be used to smooth and polish tooth surfaces after occlusal disharmony has been corrected by spot grinding with stones.

Heretofore, I have discussed the correction of occlusion when a normal relation of the posterior teeth exists. Should these teeth occlude in a "crossbite" relation, the upper buccal and the lower lingual cusps become the cutting cusps in function (Fig. 9) and the same cusps maintain the maxillomandibular open relation. Should premature contact exist in the lateral eccentric relation, it may be relieved by reducing the buccoclusal incline of the upper tooth or the linguoclusal incline of the lower tooth, but only one of these inclines should be ground. Either the upper buccal cusp or the lower lingual cusp will maintain harmony in the centric relation. The grinding of both cusps will permit closing of the "bite" or subsequent exfoliation with a wedging of the teeth involved, conditions causing discomfort, limitation of function and continued trauma. Premature contact in the balancing position would be corrected by grinding the lower buccoclusal incline and the upper linguoclusal incline. Should premature contact exist in a protrusive position, the point chosen to maintain contact in the centric relation, that is, either the upper buccal or lower lingual cusp, must not be ground. Premature contact in this position is not due to the prominence of the point, but to excessive steepness of the surface on which it functions and should be corrected only by reducing the incline of the plane. The grinding of the point would destroy harmony in other occlusal positions.

After occlusal harmony has been established in the centric position, one may proceed by correcting disharmony in either protrusive or right or left lateral relation. I prefer to make corrections first in the lateral relations. All inclined surfaces associated with one lateral movement are independent of similar surfaces associated with the opposite lateral movement, and correction may be made in either position at different sittings, if desired. Correction in one position will never introduce disharmony in another or subject the patient to added discomfort unless the distribution of stress in the centric position is disturbed. This may be done, not only by the removal of

the supporting cusps, but also in the grinding of tooth inclines, if the grinding is carried too deeply into the central fossae or rest position.

In discussing the grinding of the natural teeth, we recognize the many abnormalities due to wear, tooth migration, rotation, etc. We recognize also that sensitiveness of tooth tissue may render impossible the removal of the desired tooth surface and necessitate a compromise. We must know when we are violating fundamental principles, and we must be fully aware of the possible results.

A failure to recognize and observe fundamental principles is far more serious in grinding natural teeth than in grinding artificial. It is true, of course, that we are dealing with substance which we have no power to replace. It is easier to grind a tooth out of function than it is to relieve trauma and not remove the tooth from contact in centric or eccentric positions. Discomfort following an effort to correct occlusal disharmony is due to the fact that the teeth are ground out of function in a manner to cause a loss of the maxillomandibular opening, wedging or undue pressure on a few teeth.

It may be possible to grind all but three teeth of an artificial denture out of contact in a given position without subjecting the supporting tissues or an area of support to added stress or injury, as three widely separated points of contact will distribute the applied force over the entire or maximum supporting area. On the other hand, with natural teeth, removal of each tooth from contact in any position places an added burden on the remainder. If improper surfaces of natural teeth are ground, and portions of the centric occlusal contact removed, natural teeth may exfoliate, and contacting inclines produce a wedging of the teeth followed by recurrent disharmony in the eccentric positions.

## CONCLUSION

The study of occlusion presents one of our most interesting problems of today. It has been stated that the greater percentage of teeth are lost not from decay, but from periodontal disease. That disharmony of occlusion is the greatest factor in the production of disease in the periodontal tissues is a well-known fact. That the physical agony associated with artificial dentures can be attributed to occlusal disharmony in the vast majority of cases is well known. Preventive dentistry is a common practice in operative procedure, and the loss of the teeth from caries is now being greatly diminished. Therefore, it would seem that the future welfare of those who put their trust in us, and for whom we must bear a feeling of responsibility, demands that we incorporate a study of occlusion in our everyday practice as a preventive measure, not just as a means of eliminating the annoyance of a denture patient who calls too frequently, but also as a means of preserving the teeth of young patients.

400 Madison Avenue.

# A SIMPLE METHOD FOR DETECTING SYPHILIS IN ROUTINE DENTAL PRACTICE*

By CHARLES ROBERT REIN, M.D., and M. HILLEL FELDMAN, D.D.S.,
New York City

THE purpose of this paper is to demonstrate a simple method for the detection of unsuspected syphilis in routine dental practice. This is accomplished by means of a simple precipitation test[1] with a few drops of blood easily obtained from a bleeding socket after the extraction of a tooth. In a previous publication,[2] we described this method and presented our results in more than 2,000 specimens. If all dental surgeons would adopt this method, it would disclose to thousands of persons the fact that they were suffering from syphilis at a period when its ultimate dangers could still be obviated through proper consultation and adequate treatment.

There has been an increasingly widespread use of the various precipitation tests for the diagnosis of syphilis owing to the fact that these tests are simple in technic and, at the same time, are as accurate as the complement fixation or Wassermann tests. Of the various precipitation tests, the microscopic slide test developed by Kline[1] has been found by many to be accurate and extremely simple in technic. Littmann[3] reviewed 147,250 Kline tests performed in sixteen clinics in various parts of the country and found the results consistent with clinical findings in from 96 to 99 per cent of cases, according to the sources of material studied. In addition, he found the Kline tests to be more sensitive than the Kahn, Wassermann and Hinton tests in various stages and types of syphilis.

During the past year, several of the larger insurance companies have been contemplating the use of routine blood tests for the detection of syphilis in insurance applicants. When the Metropolitan Life Insurance Company adopted Folin's micromethod for sugar determination, they had in mind the development of a method for the detection of syphilis, obtaining the blood in similar small amounts from a simple finger puncture. The test had to be one that would give satisfactory results even ten days after collection to allow ample time for the specimen to be sent to the home office laboratory from the outlying districts. A simple method[4] was devised whereby small quantities of blood could be collected in small glass pipets from a single finger puncture. Sufficient serum (0.05

*Read at the New York Dental Centennial, Dec. 6, 1934.

1. Kline, B. S.: Microscopic Slide Precipitation Tests for Syphilis, Baltimore: Williams and Wilkins Co., 1932.

2. Rein, C. R., and Feldman, M. H.: Simple Method for Detection of Syphilis in Routine Dental Practice, Am. J. Syph. & Neurol., 18: 440 (Oct.) 1934.

3. Littmann, S.: Clinical Evaluation of 147,250 Microscopic Slide Precipitation Tests for Syphilis, Cutan. & Urol. Rev., 36:245 (April) 1932.

4. Rein, C. R.: Value of Kline Precipitation Test for Syphilis, Ass'n Life Ins. M. Directors America, 19:273, 1932.

c.c.) could be obtained in this manner for a diagnostic Kline test. During the past year, the Metropolitan Life Insurance has performed over 2,000 Kline diagnostic tests on applicants for insurance, with excellent results.[5]

Owing to the fact that the Kline test could be accurately performed with small quantities of blood, easily collected from the bleeding sockets after the extraction of teeth, the following study was made. The majority of the blood specimens studied in this present series were obtained from the private practice of one of us (M.H.F.). The remaining specimens were from his service at the dental clinic of Lincoln Hospital. The specimens were obtained from patients under local and general anesthesia.

TABLE 1.—RESULTS OF TESTS.

| | Number | Percentage |
|---|---|---|
| Negative | 3,826 | 94.16 |
| Doubtful | 161 | 3.96 |
| Positive | 76 | 1.87 |
| Total | 4,062 | |

The blood specimens are collected in small glass pipets about 4½ inches long with an inside diameter of about 3 or 4 mm. The pipet is slightly tapered at one end, which allows for better capillary attraction and aids in filling the tube. The tapered end of the tube is held just below or to the side of the bleeding socket immediately after the extraction.

When the tube is half full of blood (this will yield sufficient serum for two tests), it is removed from the patient's mouth and the tapered end is closed with a rubber "policeman." This prevents spilling and minimizes evaporation of the serum. If the specimens are kept in the refrigerator, they will be satisfactory for testing even one week after collection.

TABLE 2.—RESULTS OF TESTS.

| | Males | | Females | | Children | |
|---|---|---|---|---|---|---|
| | Number | Percentage | Number | Percentage | Number | Percentage |
| Negative | 551 | 95.65 | 604 | 91.79 | 109 | 94.78 |
| Doubtful | 1.6 | 2.77 | 40 | 6.07 | 6 | 5.21 |
| Positive | 9 | 1.56 | 14 | 2.12 | 0 | 0 |
| Total | 576 | | 658 | | 115 | |

In the laboratory, the rubber policeman is removed and the tapered end of the tube is sealed in a flame. A fine wire is inserted into the blood pipet and the clot is broken. The tubes are then centrifuged at high speed for one-half hour. This separates the clear serum, pus and débris. After centrifugation, the bloods are inactivated in a water-bath at 56 C. for one-half hour. After inactivation, the pipet containing the blood is filed just above the level of the blood clot and then broken. The clear serum is delivered into a 1 c.c. graduated pipet.

5. Rein, C. R., and Le Moine, M.: Value of Kline Precipitation Test for Detection of Syphilis in Applicants for Life Insurance, Arch. Derm. & Syph., 30:190 (Aug.) 1934. Rein, C. R., and Le Moine, M.: Relation of Syphilis to Life Insurance, Urol. & Cutan. Rev., to be published.

The preparation of the diagnostic antigen emulsion and the detailed method of performing this precipitation test is described by Kline[1] in his book.

## RESULTS

In this series, 4,063 specimens were examined, of which 76, or 1.87 per cent, gave positive reactions for syphilis. There were also in this series 161, or 3.96 per cent, doubtful reactions, in addition to seventy-six definitely positive blood tests. An attempt was made to recheck some of these doubtful cases, serologically and clinically. The majority of the persons examined gave a definite history of syphilis. Some were patients who had received inadequate treatment, while others had treated or untreated congenital syphilis. Among the seventy-six persons with positive blood reactions, only three presented cutaneous manifestations of syphilis. One girl had a syphilitic alopecia and mucous patches in the mouth. Two men presented gummatous lesions on the arms and legs. The remaining seventy-three persons had latent or concealed syphilis. It is well known that a positive blood reaction is sometimes the only definite evidence of a syphilitic infection and may be the sole means of detecting syphilis in its latent and concealed stages. Hazen[6] estimates that about 400,000 cases of fresh syphilis develop each year in the United States, but only 42 per cent undergo treatment during the first twelve months. The majority of the remaining cases in time become free of the skin manifestations and constitute the so-called latent or concealed syphilis.

## COMMENT

The incidence of syphilis necessarily varies with the race and social stratum of the victims. Kiser and Bohner[7] found that in 2,873 consecutive blood examinations of private white patients, 105, or 3.65 per cent, had strongly positive reactions for syphilis. Granger[8] made a similar study of private colored patients and found that 16.5 per cent gave positive serologic findings. It is most important to point out that the patients in our series were apparently normal, healthy persons who presented themselves only for dental extraction; while, in the series of Kiser and Bohner and Granger, it is highly probable that a number of the patients went to the physicians because of symptoms referable to their syphilitic infection. This would account for the fact that the incidence of syphilis was lower in our series.

## CONCLUSION

In view of the incidence of greater morbidity among untreated syphilitics, it is clear that early diagnosis and adequate treatment of the disease is imperative in all cases. Therefore, it is important that all dentists and physicians perform routine blood tests on all their patients to detect the numerous cases of concealed or latent syphilis. Herein is described a simple blood test which is more sensitive and more accurate than the other complement fixation or precipitation tests. In addition, the test can be made with a few drops of blood, easily obtained from a bleeding socket after the extraction of a tooth.

580 Fifth Avenue.

730 Fifth Avenue.

6. Hazen, H. H.: Treatment of Cardiovascular Syphilis, Am. J. Syph., 16:289 (July) 1932.

7. Kiser, E. F., and Bohner, C. B.: Incidence of Syphilis in Private Practice, J.A.M.A., 98: 1631 (May 7) 1932.

8. Granger, W. R. R.: Incidence of Syphilis in Private Practice Among Negroes, Am. J. Syph., 16:303 (July) 1932.

# LACERATION OF THE FACE WITH TRAUMATIC AVULSION OF THE ENTIRE MAXILLA: REPORT OF CASE*

By FRANZ WILHELM STUMPF, D.D.S., San Antonio, Texas

*History.*—June 4, 1933, a Mexican, aged 24, was brought to the hospital with an irregular laceration of the face, from the lower border of the left ear through the angle of the mouth; and a similar laceration from the lower border of the right ear to a point on a line with, and within 2 cm. of, the angle of the mouth. As the patient was being helped from the conveyance, the maxilla was found on the floor of the car.

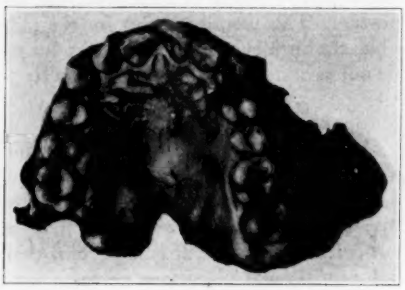

Fig. 1.—Palatal view of maxilla showing amount of malar bone involved.

On examination, this part, the hard and soft palates, the vomer, a part of the malar bones on either side, the floors of both maxillary sinuses and all of the teeth in the dental arch (with the exception of the upper right second molar hanging from a gum tissue fragment) were found intact. (Figs. 1-2.)

*History of the Accident.*—The patient, with another man, was driving an automobile along the highway when the car suddenly left the elevated grade and dashed into a barbed-wire fence several feet below. The patient was thrown against the fence in such a way as to cause the face to be sawed by the wire until the car was stopped by a fencepost. From this description, it was deducted that the maxilla was literally sawed from the skull.

Fig. 2.—Anterior view showing height to which the avulsed maxilla extended. The floors of the maxillary sinuses are seen from the superior aspect.

*Examination.*—The patient was well developed. There were no abnormal findings in addition to rapid pulse and the above-mentioned lacerations and fractures. Morphine one-fourth grain and atropine one-one hundred and fiftieth grain were administered.

*Operation.*—Under conduction and in-

*From the department of Oral Surgery, the Robert B. Green Memorial Hospital.

*Read at the monthly meeting of the San Antonio Dental Society, Dec. 11, 1934.

*A moving picture showing the various stages of the patient's condition, extending over a period of eighteen months, was presented when the paper was read.

filtration procaine anesthesia, the dissociated maxilla was fitted into the mouth to determine how the loss occurred. It was then removed. The soft tissue fragments were adapted to each other for the purpose of establishing their relations before suturing. The left parotid gland was suspended in the oral cavity, and some interstitial tissue was hanging from the wound in the right cheek. Pursuant to attaining surgical cleanliness, these parts were pushed to place and sutured with plain catgut. The face was sutured with interrupted dermol suture. The soft tissues anterior to the uvula were sutured on either side in order to permit a bridge of soft tissue to complete

Fig. 3.—Buccal fistula through which parotid gland had drained for two months.

the remaining portion of the soft palate. The anatomic picture disclosed the base of the skull taking the position of the hard and soft palates. The maxillary and nasal sinuses were widely exposed; which promised excellent drainage. A nasal tube was inserted for feeding and the cheek wounds were prepared for dressing. Oxidizing solutions were used freely after feedings.

*Laboratory Findings.*—The urine was negative. Blood examination, one day after admission, showed: red cells 4,300,000; hemoglobin, 85 per cent, white cells, 32,650. The Wassermann reaction was negative. Four days later, the white cells dropped to 10,350, with hemoglobin 75 per cent. The red cells numbered 3,710,000. There was a slight fluctuation for several days and five days later there appeared to be no danger of any complications. All of the laboratory

Fig. 4.—Result of plastic repairs. The opening had been reduced to 3 mm.

Fig. 5.—Anterior view of case.

cultures were negative. The patient was dismissed from the hospital June 21, with instructions to return daily for dressings.

*Outcome.*—For a period of two months, the parotid gland drained through the fistula to the outer surface of the cheek on the left side. (Figs. 3-5.) The opening

was enlarged with a hemostat and sutured inward. There was no further salivary drainage after the surgical wound healed. Vulcanite blocks were made and inserted in the mouth in order to minimize soft tissue shrinkage.

Healing progressed nicely until the fourth month, when an attempt was made to close a cleft of the nasal cavity by plastic means. The tissue was cut from the inner surface of the left cheek and suspended by a pedicle. A 50 per cent successful result was attained. At a later date, the Federspiel tension plates were used to assist in closing a buttonhole about 12 mm. in diameter. Lack of cooperation of the patient resulted in only a minor improvement. In the early part of June, 1934, I endeavored to close the remaining cleft by means of rubber band suturing. The cleft remaining was less than 3 mm. in diameter and this was treated with nitrate of silver at three or four day intervals until closed.

COMMENT

A thorough search of the literature did not reveal any case of avulsion of the entire maxilla, and what seems singular in this case is that the patient lived and had no complications.

It is to be hoped that we can make a successful osteoperiosteal graft in order to secure sufficient osteogenesis that an artificial denture may be made.

Medical Arts Building.

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*Nutrition and Infection.*—Loss of resistance to infection has been established by animal experiments in cases of deficiency of vitamins A and C, and with some degree of certainty in cases of deficiency of vitamin B. Clinical observations also indicate that loss of resistance to infection occurs in man with outspoken deficiency of vitamin A and probably of vitamin C. There is some indication but not yet certainty that animals with rickets are more susceptible to certain infections. Rachitic infants are no less resistant than nonrachitic infants to infections outside the respiratory tract; it is not yet certain that their resistance to respiratory infections in general is decreased by rickets, with the exception of pertussis, in which disease resistance is very much decreased. There exists no evidence in experiments with animals or in clinical observation that the addition of any of the vitamins to the diet will increase the resistance to infection of the host when the host has already been consuming a normal diet. There is also no evidence that a good diet will decrease the number of infections during the first six months of life. There is some evidence that an adequate diet in the early months of life may decrease the severity of infections during the latter part of the first year and during the second year. There is little reason to believe that the administration of vitamins after the onset of an acute infection will exercise any benefit on resistance. Chronic infections have so far not been adequately observed with the exception of tuberculosis. Beyond doubt a constitutional state exists in infants, characterized by the susceptibility to infection and a loss of resistance. This state tends to persist. Many factors besides diet contribute to this state: age, sex, heredity, allergy, prematurity and earlier severe illness. I believe that an early adequate diet, particularly one rich in vitamin A, tends to prevent the development of this condition.—S. W. Clausen, in *J.A.M.A.*, March 9, 1935.

# The Journal of the American Dental Association

212 East Superior St., Chicago, Ill.

C. N. JOHNSON, Editor

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Published by the American Dental Association



All expressions of opinions and all statements of supposed facts are published on the authority of the writers over whose signature they appear, and are not to be regarded as expressing the views of the American Dental Association, unless such statements or opinions have been adopted by the Association.

Communications intended for publication in the scientific or literary pages of THE JOURNAL should be addressed to the Editor. All advertising or business matter should be sent to the Business Manager.

Subscription is included in the annual membership dues. The subscription rate to non-members is $5.00 a year in advance, this rate applying to both domestic and foreign subscribers. All foreign subscriptions are to be paid in United States money.


# *Editorials*

## A PREVALENT THREAT

During the past year or so, the profession has been treated to repeated threats on the part of certain propagandists that if we did not "do something" that "something would be done to us." Just what this something was, it was never made quite clear to us, but the implication was that if the profession did not fall in with the idea of state dentistry, or some other vagary of the kind, the state would take the situation into its own hands and direct the policy of dental practice. This threat has been flung at us in season and out of season, and it was practically a case of stand and deliver. But deliver what?

The very first question that must naturally arise in this connection would be: How would the state do it? By what process of law or order would the state carry out this dire threat? Would it enact legislation in all of the forty-eight states changing the methods by which men and women were in the habit of conducting their dental practice and compelling them to proceed according to the ideas or

dictates of the state officials? What would be the result of state domination? Again, how would it be brought about? The Federal Government could not do anything because the constitution grants to the various states the right to regulate their own police powers (though it would seem as if at times the government was tempted to try to do anything, even to changing the constitution).

We have been told that our methods of practice are all wrong, that we should deliver dental service in groups and that the low pay clinic was the solution of all our ills. But is it? Has dentistry developed as the result of the low pay clinic? Has one single new idea in the science and art of dentistry ever come from this source to enrich the knowledge of the profession? Have the people been better served by all of the laudable efforts of the low pay clinic? What has been the experience of the past? Has the character of the work turned out by the low pay clinics been of a nature to commend it to the consideration of either the people or the profession? Has not the tendency always been to degrade dentistry?

Not one concrete or practical suggestion has ever been brought forward by the propagandists whereby the people would be better served or the profession in any way advanced—not one. Radicals may ride triumphantly on their hobby horses for a time, but the good sense of the people and the profession can be trusted to ultimately catapult the radicals out of the saddle and land them in the bog of confusion that is their natural element.

Constructive criticism is always helpful and always welcomed, but threats such as we have been listening to in the recent past are not only ill advised, but, in the light of experience, they are also essentially silly. To threaten the American people or the American profession is not to get their acquiescence or their cooperation. It is not on record that either the people or the profession have ever been scared into doing anything.

We have repeatedly been told that our profession is not doing anything either in the way of economics or of relief. Organized dentistry has been belittled and its officials criticized on numerous occasions for not instituting measures that would emancipate the profession and the people. But what measures? And from what were we to be emancipated? Not a single concrete or practical sug-

gestion has ever come from the propagandists, not a word of any kind that would aid in solving any of the current problems of the day.

The most pointed threat had relation to what the state legislatures were to do to us when they met. The hue and cry was to the effect that if the profession failed to do certain things (just what things has, as we say, never been clearly stated), these things would be done to the profession. It was not a matter for consultation or discussion: it was a threat.

Let us see. This is written in the month of June when most of the legislation affecting economic or professional policy is over for the session, and it may be pertinent and profitable for us to ask how much legislation of an iconoclastic character has been enacted. Not one single provision of a nature to challenge the welfare of the profession or the people has to our knowledge been placed on the statute books. In fact, whatever legislation has been passed affecting the profession has all tended to strengthen the principles of organized dentistry and to safeguard the people. Note the Oregon law and the Supreme Court decision sustaining it. Note the practical embargo that has been passed on the advertising of professional service before the public. Never has the principle of true professional conduct been more generally sustained by our legislatures than in the session just closing. So the current threats appear to have run wide of the mark.

Of course, we know only too well that certain of the constructive provisions recently enacted will be subjected to opposition. The agencies of evil do not yield with easy grace, and the price of continued advancement is eternal vigilance. But the profession may well be congratulated on the fact that, at the present time, there is so much of encouragement and so little of menace. Apparently, the current threats of the recent past have borne little fruit except mayhap to act as a boomerang.

## THE SLOGAN—45,000 MEMBERS IN 1935

The membership in the American Dental Association is greater at the present writing than ever before at this time of the year. This

is due to several agencies, the inherent strength of the organization, which has been growing stronger each year, the unremitting labors of the membership committee, the more wide-spread realization of the value to the individual dentist of membership in a large central organization like the A.D.A., the general awakening of the profession to the benefits of organized dentistry, the improvement in the economic status of the members of the profession and a more active demonstration of the concrete benefit to be gained from association.

The service rendered to the membership by the officers and the various commissions and committees is of the greatest possible benefit, and each member obtains much more in return than the small amount that he pays in dues. There are many good clean ethical men still outside of the Association, and each member should approach one of these men and personally enlist his interest sufficiently to induce him to join.

Personal solicitation is the most effective of all means for adding to our membership, and the goal of 45,000 should not be difficult to reach if every member would stir himself and solicit a nonmember.

In connection with this idea of increased membership, there is another goal to be approached. Among the most important activities of the American Dental Association is its life insurance coverage. To assist our officers, the Association itself and the state societies, and to further strengthen the insurance feature of the American Dental Association, the Insurance Secretary has set a goal of "5,000 additional insureds for 1935." This goal should be easily attained with the cooperation of the officers of the state, district and local societies from whom full information can be obtained regarding the coverage.

The experience of the American Dental Association with this life insurance is quite remarkable. To date, more than $1,166,000 has been paid to the families of deceased members, many of whom left no other insurance or estate. A $3,000 insurance policy is offered and the cost averages from 0.6 per cent to slightly over 1 per cent, depending on the age of the person insured. In this low cost, the members of the American Dental Association are enabled to obtain coverage at a figure far below the cost of the same coverage to them as individuals. There are but two limitations to the obtaining of

this insurance: the members must be in good health and not past 50 years of age. Membership in good standing of the American Dental Association is essential.

Take full advantage of the privileges given you by membership in the American Dental Association.

Be one of the early members to make the 5,000 additional for 1935.

Help the "45,000 members for 1935" movement by telling your friends in the dental profession.

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# *Obituary*

## CHALMERS J. LYONS

**(1874-1935)**

In the death of Chalmers J. Lyons, of the School of Dentistry, University of Michigan, May 18, 1935, the profession lost one of its outstanding oral surgeons and dental educators.

Dr. Lyons was born in Martinsburg, Ohio, April 30, 1874. He received his early education in Central Michigan Normal School at Mt. Pleasant, Mich., and graduated from the University of Michigan, College of Dentistry in 1898. He later received the degree of doctor of dental science from the same institution. He practiced in Adrian, Mich., and later in Jackson and then moved to Ann Arbor, where he remained till his death.

In 1915, he assumed a full-time professorship in the department of oral surgery in the dental college and the University Hospital. During the years that followed, he built his department from very humble beginnings to a pretentious and notable clinic which was known and visited by dental and medical practitioners throughout the country and from abroad.

Not only was Dr. Lyons an able surgeon; he also was a capable and inspiring teacher. As a tribute to this teaching, his former students organized a group known as the Chalmers J. Lyons Club, composed of specialists in oral surgery and general practitioners of dentistry who have attended his postgraduate courses and have benefited by his teaching.

Dr. Lyons was a member of the organization of the American Association of Oral and Plastic Surgeons and was president of the association from 1933 to 1934. This is especially significant when it is known that he was the only member of that organization who did not have a medical degree.

During the years of his service, Dr. Lyons contributed largely to dental and medical literature in the field of oral surgery. He was the author of a text entitled

"Fractures and Dislocations of the Jaws." He also contributed to the "American Textbook of Operative Dentistry" (Ward) and "Oral Surgery" (Mead).

Dr. Lyons received many honors and awards in recognition of his distinguished service. He was past president of the Michigan State Dental Society. In 1933, he received the Jarvie Medal from the New York State Dental Society. He was past grand master of the Delta Sigma Delta fraternity and a Fellow of the American College of Dentists. For many years, he was a member of the Michigan State Advisory Council of Health, a position which he held at the time of his death. He was a member of Sigma Xi, Phi Kappa Phi and Omicron Kappa Upsilon, honorary fraternities. He also held membership in many dental and medical organizations. He was a member of the Episcopal church, a Mason, a Republican, and a member of the Ann Arbor Rotary Club. He also was an ardent and enthusiastic golfer and a member of the Barton Hills Golf Club.

The mere recitation of the life and achievements of Dr. Lyons cannot adequately express the true character of the man or the influence which he exerted on all who came in contact with him. His personality was a rare combination of dominance and force of character, with a capacity for great achievement, combined with a beauty and sweetness of spirit that radiated kindliness and interest and helpfulness on everyone he met.

Dr. Lyons is survived by his wife, Grace, one son, Richard H., a brother, James W., of Jackson, Michigan, and a sister, Mrs. A. Fisher, of Newark, Ohio. Interment was in Forest Hill Cemetery, Ann Arbor.

## PRACTICE IN PARAGRAPHS

*This department is intended for busy readers. It aims to tell a vivid story in a few words. Items should be of a practical character, and free from padding—not more than a paragraph or two. We exact no limit, but two hundred words can tell most of these stories. Send in your ideas; they will be welcome.*

**Hand of Nature vs. Fingers of the Dentist**—Slighted by nature, unfinished enamel rods helped most to make our thirty-eight dental schools a necessity. Defective enamel rods are the logical prey of defective, starchy, unnatural foods. Dentistry must succeed where nature failed, and the dentist must begin where nature quit. Patients usually believe that a tooth once filled must stay filled and that the hand of nature must be supplanted by and improved on by the fingers of the dentist. Patients must be educated to realize more by expecting less, making disappointments fewer and easier to bear. Distrust and misunderstanding may then succumb to enlightenment and understanding—*Herbert Ely Williams, Red Bank, N. J.*

**Suffering vs. Understanding**—High school anatomy is soon forgotten by dental patients. They are more concerned in the nervous trend of the times than in the nerve supply of the teeth until something happens. Then toothache to the patient and odontalgia to the dentist are just the same. Both are painful, and difficulty often

arises in explaining why several teeth apparently ache on the same side. Shaking a clothes line full of clothes involves every garment hanging thereon. This crude illustration is often more effective than visualization by model or printed page or other efforts to convince the doubting patient as to how much we know. One instinctively tells the patient that pain always stays on its own side and that the opposite teeth are on another clothes line.—*Herbert Ely Williams, Red Bank, N. J.*

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**Jumbo Mouth Mirrors**—Mouth mirrors styled "jumbo" are not only large in size, but also practical in use. In scaling lingual surfaces in prophylaxis procedures, they compress and dam off the tongue, which instinctively persists in getting where it is unwanted. When patients are asked to depress the tongue, it invariably goes out of control in direct opposition to the instruction given. In various other operations, the tongue occasionally plays an obstinate, stubborn rôle. The jumbo mirror equipped with a sensible, nonslipping old fashioned wooden handle is an invaluable tongue controller. Modern sterilization eliminated the wooden handles in vogue a third of a century ago. To prevent revolving in perspiring fingers, an unnecessarily tiresome grip is required, especially in summer. The study of micro-organisms and the pathologic conditions incidental thereto makes modern sterilization of all instruments imperative. If sterilization of only one filling material is possible, the semisterilization of wooden handles should be reasonably excusable.—*Herbert Ely Williams, Red Bank, N. J.*

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**Blanching of Some of the Bakelite Denture Base Materials**—After separating the flask and boiling out the wax residue and washing well with a wax solvent such as carbon tetrachloride or chloroform, place both halves of the flask on a quarter inch iron plate 10 by 10 inches and set over a gas plate with a low flame or over an electric plate turned on low until all free water is driven off. The amount of time required for this depends on the amount of heat under the plate, but about twenty-five or thirty minutes suffices. Then cool to temperature that leaves the flask just warm enough to handle. Pack as directed by the manufacturer and press slowly with the model side of the flask, cool in a dry heat, press with plates very warm but not hot, and kept at this temperature until closed. Remove at once and put into a cold vulcanite press. This pressing into a dry flask forces the material through any minute perforations in the foil (the case is to be entirely foiled as prescribed by the maker) and what goes through seals the bulk from steam when in the vulcanizer. We have sealed pinhead holes in this manner, though it is advisable to seal all visible holes with foil.—*Esther E. and F. J. Svoboda, Cozad, Nebr.*

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**Sitting vs. Standing**—If thirty-five years of sitting and working at the dental chair fails to reveal one disadvantageous feature, the posture must possess practical merit. Only yesterday, a 37-year-old dentist complained of "dentist's knee," to which the left knee is more susceptible. Examination revealed enlargement of the left knee, to which most dentists are more or less subject, sooner or later. Tumbling arches and knee enlargements are logical penalties of unnecessary standing because standing is more severe on foot and knee than either walking or sitting. Sitting distributes the

weight upon strong, broad, cushion-like muscles, designed to save knees and arches from premature complications. Sitting helps most to add five practice years to the average dental career. Some dentists escape trouble with their standing equipment just as some soldiers escape the fatalities of war. Sitting is one of the secrets of the daily making of gold-foil fillings of inlay size. Gold-foil operators who sit have been accused of laziness. Incompatibility teaches that laziness and gold-foil are "poor mixers." There is nothing to be lost in sitting and nothing to be gained in standing.—*Herbert Ely Williams, Red Bank, N. J.*

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**A Life-Saver**—For twenty years, I had been a sufferer from dermatitis, without finding a cause or a cure. My right thumb and first two fingers inside would itch under the skin and break out with cracks nearly an inch long, necessitating the use of adhesive tape and rubber fingers. About five years ago, in reading dental journals, I found the cause to be the careless handling of procaine while injecting, so I changed my hypodermic syringe to the breech-loading type and airtight carpule tubes. My working fingers came back to normal, with no more cracks. This in itself was a godsend. Next, the dermatitis attacked the back of my right hand in the region of the two last fingers, owing to a back spray or careless injections and negligence in the use of rubber gloves. Itchy pimples would form, and once on a July vacation in 1933, the eruption worked up onto my wrists. I would have given $500 for a cure. I had tried a dozen different ointments. On my return, a local physician prescribed a jar of mazon ointment and mazon soap put up by Belmont Laboratories of Philadelphia. In two weeks, everything cleared up, and I used no other soap for a year. I have had slight occurrences occasionally, all due to my own carelessness in the use of procaine, but the careful use of this remedy never fails.—*Albert E. Atkinson, Buffalo, N. Y.*

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**Damage from Clasps**—There is no deleterious effect from employment of clasps on the underlying enamel if they are correctly made of round wire. They should be as long as possible to provide a liberal margin of protection against deformation in insertion and removal. Stabilizing lugs or occlusal rests should always be used with them to prevent vertical movement and consequent wear of enamel and to relieve the clasps of lateral strain.

When gold wire of the correct quality is used, the right sizes are 19 gage for molars, 20 gage for bicuspids and 21 gage for light use, and for full crib clasps attached at both ends and passing over the occlusal plane in occlusal embrasures. The constant dislodgment (sluicing) of mouth fluids through the small contact areas by the movements of tongue, cheeks and food across the wider vestibule of approach to the narrow contact line of clasp and enamel prevents stagnation there for periods long enough to establish decalcifying influences. Over thirty years of observation has satisfied me that round wire clasps do not cause caries or influence erosion. When correctly formed and used with adequate stabilizers, they may be relied on for many years of efficient service. Their intelligent application eliminates the need for much destructive cutting of sound teeth to permit of fixed bridgework or intracontour retainers.—*Henry W. Gillett, New York City.*

# COUNCIL ON DENTAL THERAPEUTICS

## ACCEPTED DENTAL REMEDIES

The following articles have been accepted as conforming to the Rules of the Council on Dental Therapeutics of the American Dental Association. The Council desires dentists to understand that the admission of an article does not imply a recommendation. A copy of the rules which govern the Council in the consideration of articles will be sent on request.

SAMUEL M. GORDON, *Secretary.*

### BARBITALS*

**Ortal Sodium.**—Sodium *n*-hexylethyl barbiturate.—Sodium *n*-hexylethyl malonylurea.—$NaCH_3.CH_2.CH_2.CH_2.CH_3.CH_2.(C_2H_5)CCONHCO:NCO$. The monosodium salt of *n*-hexylethyl barbituric acid. Ortal sodium differs from soluble barbital, U.S.P. (sodium diethylbarbiturate) in that one of the ethyl groups of the latter is replaced in the former by a *n*-hexyl group.

PROPERTIES: Ortal sodium is an odorless, white or slightly yellowish powder, with a bitter taste; very soluble in water; soluble in alcohol; practically insoluble in ether and benzine. An aqueous solution of ortal sodium has an alkiline reaction to litmus.

ACTIONS AND USES: The actions and uses of ortal sodium are essentially similar to those of barbital, but ortal sodium is more active than barbital and it is used in correspondingly smaller doses.

DOSAGE: From 0.2 to 0.4 gm. (3 to 6 grains) followed by a glass of water. It is rarely necessary to give more than 1 gm. (15 grains) in twenty-four hours. When oral administration is contraindicated, ortal sodium may be administered rectally.

Manufactured by Parke, Davis & Company, Detroit. U. S. Patent 1,624,546 (April 12, 1927; expires 1944). U. S. trademark 302,616.

*Capsules Ortal Sodium, ¾ grain (0.05 gm.).*
*Capsules Ortal Sodium, 3 grains (0.2 gm.).*
*Capsules Ortal Sodium, 5 grains (0.3 gm.).*

CAUTION: Aqueous solutions of ortal sodium are not stable but decompose on standing. On boiling, a precipitation occurs, with evolution of ammonia.

Other tests for identity and purity appear in New and Nonofficial Remedies, 1935, page 100.

## ANNUAL MEETING OF THE COUNCIL ON DENTAL THERAPEUTICS

**It is an established principle of the Council on Dental Therapeutics to advise the members of the dental profession and the public of its decisions as soon as circumstances permit. In accordance with this established principle, the following items discussed during the last meeting of the Council, which may be of interest to both dentists and manufacturers, are authorized for publication.**

SAMUEL M. GORDON, *Secretary.*

The Council on Dental Therapeutics of the American Dental Association held its sixth annual meeting at the Central Office, 212 East Superior Street, Chicago, Sunday

*Accepted Dental Remedies, 1934, p. 51.

and Monday, April 14 and 15, 1935. The following members were in attendance: J. Howard Brown, Ph.D., Sc.D., associate professor of bacteriology, Johns Hopkins University, Baltimore, Md.; Paul J. Hanzlik, M.D., vice-chairman of the Council, professor of pharmacology, Stanford University School of Medicine, San Francisco, Calif.; Thomas J. Hill, D.D.S., professor of clinical oral pathology and therapeutics, Western Reserve University School of Dentistry, Cleveland, Ohio; Arno B. Luckhardt, Ph.D., M.D., LL.D., Sc.D., professor of physiology, University of Chicago, Chicago, Ill.; John A. Marshall, Ph.D., D.D.S., professor of dental pathology and biochemistry, University of California, College of Dentistry, San Francisco, Calif.; Victor C. Myers, Ph.D., Sc.D., professor of biochemistry, Western Reserve University, Schools of Medicine and Dentistry, Cleveland, Ohio; U. Garfield Rickert, M.A., D.D.S., professor of materia medica and therapeutics and hygiene, University of Michigan, School of Dentistry, Ann Arbor, Mich.; Harold S. Smith, D.D.S., chairman of the Council, 180 North Michigan Avenue, Chicago, Ill.; Samuel M. Gordon, Ph.D., secretary of the Council, chief, A.D.A. Bureau of Chemistry, Chicago, Ill.; C. N. Johnson, D.D.S., LL.D., Editor of THE JOURNAL, Chicago, Ill., ex-officio member; Harry B. Pinney, D.D.S., Secretary, American Dental Association, Chicago, Ill., ex-officio member.

Thomas L. Grisamore, Illinois Trustee of the American Dental Association, and Newton G. Thomas, Associate Editor of THE JOURNAL, were present on invitation.

Harold S. Smith and Paul J. Hanzlik were reelected chairman and vice-chairman, respectively, of the Council.

The members of the Council are particularly appreciative of the able handling by the chairman of the Council, Harold S. Smith, of several situations which concern the relation of the Council to the Association.

### STATUS OF THE COUNCIL

It was pointed out in the last report of the annual meeting of the Council on Dental Therapeutics[1] that the Council had been made a standing committee of the American Dental Association. The Council is primarily an educational, a fact-finding and a fact-reporting body. Without a medium of expression, its work would be of little value. As its natural medium of expression is THE JOURNAL, the Council noted with appreciation the efforts of the Contact Committee of the Board of Trustees, consisting of Marcus L. Ward, chairman, Harry Bear and E. G. Meisel, in effecting a closer working cooperation between THE JOURNAL and the executive departments of the Association and the Council.

Since the annual meeting of the Association in St. Paul, the Council has been accorded a generous allotment of space in THE JOURNAL. This allotment of space has permitted the Council to make available many of the reports which were in its files. It is gratifying to the Council to note, as a consequence, the continued letters of commendation from individual dentists, the public and dental societies concerning its work. This appreciation comes from all sections of the country and from all ranks and files of dentistry, which gives the members of the Council a feeling that its work is filling a real need in dentistry.

### PROJECTED PUBLICATIONS OF THE COUNCIL

From time to time, a suggestion has been made by members of the dental profession as to the desirability of reprinting in one volume all of the critical reports and the reports on pharmacology and therapeutics of the Council. This proposal is being studied. As such a proposal requires the expenditure of a certain amount of money, it would be helpful to the Council if an estimate could be obtained concerning the demand for such

1. J.A.D.A., 21:1485-1500 (Aug.) 1934.

a book. In such a book would be listed all the reports on unacceptable products. These reports, as is well known, now appear in THE JOURNAL. They have appeared over a period of six years. The compilation of these reports in one volume would be helpful in consolidating the practitioner's knowledge of the objections to some of the products already reported on. At the same time, a careful study of certain typical products which were discussed in connection with advertising which comes to him almost daily would enable him to recognize at a glance the similarity between old and new products which differ only in name.

Such a book might also be useful in acquainting young dental practitioners with some of the impositions which will be practiced on them on their entrance into practice, and an acquaintance with the reports, which would come through their compilation in one volume, will enable him to cast about him a protective mental armor.

### ADVERTISING, EXHIBITS AND THE COUNCIL

It must be repeatedly emphasized that if there were no advertising problem, bodies like the Council on Dental Therapeutics might not have been called into existence. In the ideal situation, members of the dental profession would write their own prescriptions for medicinal agents used in office practice and for the medication of their patients. But the ideal situation does not exist. Most of the drugs used by the members of the dental profession come advertised to them either in the form of proprietaries or rank nostrums. With only a few notable exceptions, advertising in dental journals is of such a character as to be misleading to the reader. The practicing dentist is, as a rule, too occupied with the routine practice of dentistry and has not the technical ability to analyze carefully each of these preparations. Hence, the character of advertising in dental journals and of exhibits at national and state dental meetings occupies a very important place in the scheme of professional drug control.

Advertising in national and local journals should be written to inform and to educate the profession to whom it is addressed, rather than to delude the profession into purchasing a product use of which may be an imposition on his patient and on himself financially. The annual exhibits of national and local state dental societies can legitimately furnish such information, provided the medicinal and other agents exhibited there are not of a character to mislead the practitioner.

Unfortunately, there had been no standards of conduct until the Council on Dental Therapeutics began its work. The only apparent standard involved the financial responsibility of the advertiser or the exhibitor. Dental organizations, as guardians of the public health, must of necessity go beyond this position.

Efforts to bring about the desired changes in THE JOURNAL and in the exhibit of the American Dental Association have been noted with appreciation. A few state and local societies have attempted sporadically to follow the desired policy, but their efforts have been thwarted by the absence of a uniform policy on the part of all dental societies. Hence, it is hoped that, in the near future, the officials of the various state and local dental societies will take steps to correct the situation in the interest of their members. This can be done by setting up a uniform policy regarding state and local dental society exhibits and for advertising in the journals and bulletins of component dental societies. This is a topic worthy of the attention of all dental administrators. A profession is judged as much by the character of the advertising in its official publications and by its commercial exhibits as by its literary and scientific attainments.

### ACCEPTED DENTAL REMEDIES

The Council noted with appreciation the reception of its book, Accepted Dental Remedies, by the dental profession. It is a matter of gratification to the Council that prac-

tically every dental school in the country either requires or recommends the use of the book in one course or another.

Current discussions regarding the desirable elements in a curriculum on pharmacology, therapeutics, materia medica and related subjects take into consideration the material in Accepted Dental Remedies. It is fair to venture that the book will in time come to occupy an important place in the teaching of the subject.

Accepted Dental Remedies, the Council desires to point out, is not in competition with textbooks. Just as textbooks contain material of a useful nature not found in Accepted Dental Remedies, Accepted Dental Remedies contains material not found in textbooks. The aim of Accepted Dental Remedies is to provide dental teachers and dental practitioners with a selected materia medica based on critical evaluation of pharmacologic and therapeutic statements. The desirability of such a simplified materia medica was long ago recognized. It has helped to bring order out of chaos in medical therapeutics. Cushny stated:

> For as long as he (the medical student) has to learn the supposed virtues of a host of obscure substances, he will tend to use them in practice, even if only tentatively. This in turn necessitates their inclusion in the pharmacopoeias, which again gives them some standing and perpetuates them as subjects of teaching and examination. If examiners would break this vicious circle, they would render the subject of pharmacology more attractive to him. There is no question that the insistence on numberless preparations of drugs of questionable value has discouraged interest in therapeutics.

Approximately 6,000 copies of the book have been sold, or approximately one to every six members.

At this writing, orders which are being received for Accepted Dental Remedies, 1934, will not be filled because it is intended not to print any more copies of the 1934 edition. It is proposed to have available the next edition, Accepted Dental Remedies, 1935, about the middle of September.

The Council discussed in detail the revision of Accepted Dental Remedies. When Accepted Dental Remedies was published, it was pointed out that it would be published annually. It will be a dynamic manual which will give to readers the current and reliable information on the various topics considered therein. Not only that: during the course of the year, changes take place in the products admitted and deleted. Such annual revision is necessary. The Council hopes that for the small cost involved in the purchase of the book, the members of the dental profession will have with them a *vade mecum* giving the most up to date reliable information on dental products.

Several of the chapters are already being considered for revision. These are on calcium compounds, dyes, cod liver oil products, dentifrices, etc. It is also proposed to add as an appendix a list of useful recipes and formulas, and also to amplify, as far as possible, the present therapeutic index.

### CALCIUM COMPOUNDS

There are, as far as the records of the Council go, at least a dozen different brands of preparations containing calcium phosphate as an essential ingredient advertised to the dental profession and sold to the public for use in "building bones and teeth."

It was noted by the members of the Council who discussed this problem that most of the advertising, while restrained, is misleading in many respects. Such advertising claims carry many generalizations which are not based on carefully controlled evidence. These claims refer to rickets and oral diseases, particularly caries. It is claimed that the ingestion of calcium and phosphorus in tablet or powder form in an amount beyond that furnished by the average dietary will prevent dental disease and malformation of teeth. Yet no clear-cut relationship has been found between the level of calcium and phosphorus in the blood and dental disease or dental conditions. No carefully controlled evidence

is available that when a diet is otherwise adequate, the addition of calcium and phosphorus compounds will retard, prevent or overcome dental caries or other diseases of the gum. The Council recognizes that there are certain conditions in which the use of calcium compounds are indicated; i.e., those which are definitely associated with a lowering of the calcium and phosphorus levels of the blood.

A member of the Council in charge of this class of products is studying the subject with a view to presenting reports to the Council, holding the products acceptable or not acceptable in the light of available evidence. In due time, these reports will be published.

### MECHANICAL AND RELATED APPLIANCES OR PRODUCTS

During the course of the year, the Council has had numerous requests for information on preparations which to some do not appear to be within the narrow field of therapeutics. Such preparations are cavity varnishes, zinc oxide impression pastes, denture cleansers and products of a similar nature.

The Council recognizes that the composition alone of a product does not indicate whether a product is a drug. The representations made for the product determine in great measure the category in which it can be placed.

Gum copal, a constituent of wood varnishes, has been used as an insulator in electrical instruments; yet its properties are such as to suggest its use for lining the cavity prior to the insertion of zinc oxyphosphate cement. The great bulk of zinc oxide is used in the manufacture of certain types of white paint, and some of it is used in cosmetics; yet its properties too are such as to suggest its use in medicine and dentistry. Its dental uses are rather wide. It is an important ingredient of zinc oxyphosphate cement. It is used for pulp capping and for temporary fillings in cavities. It, in combination with essential oils, has been used in treating so-called dry socket. A paste made with rosin and oil of cloves and other ingredients has been used for so-called pyorrhea packings. Because of the apparent properties of such mixtures, their use for a temporary rebasing of dentures and in immediate denture service was suggested. Consequently, essentially old products were put on the market under new names.

These preparations are widely advertised. A product used as a surgical cement is said to be useful for temporary rebasing of dentures. All of them contain materials having potential pharmacologic properties and potential toxicity. It would therefore appear that these products are within the purview of the Council. Consequently, the Council voted that it is the sense of the Council that any substances or appliances used in dental practice which may have a pharmacologic or toxicologic effect on the tissues should come within the purview of the Council, and it would be in the interest of the profession and the public for the Council to be consulted by the proper authorities of the Association in relation to any advertising submitted for such appliances or substances. This is in line with a previous action of the Board of Trustees, taken at Memphis in 1931, in which it was agreed that ". . . only those above mentioned agents as are approved by the Council on Dental Therapeutics . . . shall be admitted to the advertising pages of the Journal of the American Dental Association. . . ."

### FOODS

From time to time, the Council is requested to consider foods for acceptance. The Council has not agreed to consider foods since it felt that this situation was amply taken care of by the Committee on Foods of the American Medical Association. "Institutional" advertising for classes of foods by trade associations represents another situation.

Recently, a trade association submitted its advertising campaign for a food commodity to the Council for acceptance. A member of the Council was requested to study this problem. The following report, which was adopted by the Council, sets forth the Council's position on the consideration of foods at the present time:

A representative of certain flour producers recently presented to the secretary of the Council statistics indicating that the use of bread is decreasing to an alarming extent. He sought the approval of the Council on Dental Therapeutics of the American Dental Association of an advertising campaign to increase the use of bread. The referee was informed that the publicity material prepared by these and associated flour companies had been approved by the Committee on Foods of the American Medical Association. Much of this elaborate and attractive material has been submitted to the referee, who offers no criticism of it at the present time.

It has been suggested that "while the Council may not desire to consider these (food) products at the present time, there might be a possibility that it consider the advisabiltiy of placing its stamp of approval on advertising campaigns of various food associations wherein claims of dental interest are made." This is an interesting suggestion, but raises a number of questions.

It is doubtful that there are any particular foods of such importance to dental health that the American Dental Association would wish to endorse them as a means of increasing their general consumption. The only apparent object which the Association might have in passing upon food products or advertising campaigns for food products would be to discourage or prevent exploitation as regards dental claims in the advertising of such products. It is difficult to see how this could be done without considering the merits of the products themselves. It is questionable whether, in the mind of the public, the approval of advertising can be dissociated from the approval of a product.

If approval were limited to advertising campaigns of various food associations, it would become necessary to define what is meant by a food association; whether these associations might be national, state or local; also whether subassociations might be considered. For instance, in the dairy industry, there are associations of dairymen, associations of milk distributors, associations for the promotion of certified milk, acidophilus milk, cheese, butter and ice cream and associations of Guernsey, Holstein and Jersey cattle raisers, each promoting the virtues of their product. Corn products, beverages, chewing gum, candy, meat, citrus fruits, apples, bananas, cranberries, prunes, grapes, tomatoes and countless other foods doubtless each have or may have their associations in addition to the canning associations. Many of them might make claims of interest to dentists. Equally meritorious products may not be represented by associations. Should the advertising of such be excluded from consideration or approval by the Council? If this were done it would not prevent unscrupulous promotion of products by individual manufacturers or distributors.

Most of the food associations are trade associations and are competitive. The decline in the sale of a certain product is probably due to an increased consumption of other products. Dental interests may not always run parallel with other nutritional interests or with trade interests. Most foods are complex mixtures and it would seem impossible to consider their claims of dental interest apart from their general nutritive properties. They should be considered in their entirety and such consideration can best be given by such a group as the Committee on Foods of the American Medical Association. Medicinal foods of special interest to dentistry are already within the province of the Council on Dental Therapeutics. If other foods were to be considered by the American Dental Association, the referee believes that eventually it would be necessary to have a special committee on foods. Therefore, the referee recommends that the Council do not consider other than medicinal foods or advertising for such foods for acceptance or endorsement at the present time.

### COOPERATION OF MANUFACTURERS OF PHARMACEUTICS WITH THE COUNCIL

The Council devoted considerable discussion to the method of promotion of products to the dental profession by several of the larger pharmaceutic houses. Several of the

products of some of these houses are included in Accepted Dental Remedies, and cooperation on the part of these firms with the Council has been gratifying.

There are, on the other hand, certain firms that advertise extensively to the dental profession through journals and through the mail, but none of their products have been submitted voluntarily to the Council.

Such problems as the relationship of officials or former officials of dental organizations with certain pharmaceutic and supply houses, whose products come under the purview of the Council, were discussed. The Council would be derelict in its duty to the profession if it permitted such relationships to deter it from scientific consideration of these products, which will therefore be considered in the regular way by the Council, reports being issued on them in due time.

### REPRINTS OF COUNCIL PUBLICATIONS

Shortly after the appearance of Accepted Dental Remedies, proffers were made to the Council by a manufacturer of a product listed therein for permission to reprint and send gratis to every member of the profession a copy of the book. The Council considered this request and declined with thanks the proffered cooperation of this manufacturer, since the Council held that this official book must be free from any commercial association, however altruistic the offer.

After the Council accepts products of various manufacturers, requests come to it for permission to reprint the report of the Council for distribution in the promotion of the product. After thorough discussion, the following policy was adopted by the Council:

The Council looks with disfavor on the use of reprints of the Council's reports in promoting the sale of an article which has been accepted by it, but will interpose no objection to abstracting any of these reports provided the abstract is acceptable as advertising. Further, the Council requests the Editor of THE JOURNAL and the Secretary of the Association to look with disfavor on the sale to manufacturers of reprints in THE JOURNAL in which the use of drugs is spoken of.

The Council discussed the efforts of dental journals to elevate the standard of their literary and advertising pages, and the effect of such efforts in respect to the work of the Council. The Council notes with sympathy the efforts of these editors to make their pages a medium which is expressive of the highest ideals of the dental profession, and of their efforts to remove from their advertising pages those products whose sale and use are not in the interest of the public and the profession, as measured by the rules of the Council. It is therefore opposed to the reprinting of Council reports in those journals whose advertising policies are not in the interest of the profession and the public.

### LOCAL ANESTHETIC SOLUTIONS

The Council gave further consideration to the problem of local anesthetic solutions with particular reference to the reported conflicts in isotonicity of these solutions as determined by hemolysis tests and freezing point determinations. The compounding of procaine hydrochloride and epinephrine in various mediums, which apparently tend to approach the physical properties of blood, represents, in the last analysis, an artificial system. Their use is based on an analogy to the effects of solutions of single and mixed salts on blood corpuscles or other simple plant or animal cellular systems.

Local anesthetic solutions, as used in dentistry, are not injected intravenously, but are injected into tissues where the conditions are somewhat different from that in the blood stream. Intravenously injected substances are, as a rule, removed promptly, while it is well known, from clinical and other experience, that the local anesthetic injected into the tissues of the mouth is not removed with the same degree of promptness as by the blood stream. This effect is somewhat accentuated by the presence of a vasoconstrictor.

The concept of isotonicity with respect to local anesthetic solutions is often reached by analogy to the fate of simple plant and animal cells in solution of single or mixed salts, conditions which are not comparable with those under which the local anesthetic is injected. Due consideration is not always given to lipid soluble and specifically acting constituents in local anesthetic solutions which can exert tissue and cellular effects, even when used in so-called isotonic and balanced solutions.

None of Ringer's solutions used simulate blood in every respect. Tradition is behind the concept that procaine and epinephrine should be dissolved in a so-called Ringer's medium, yet complaints as to baneful postoperative effects from the use of such solutions persist. This may be due not so much to the solutions used as, in many cases, to trauma, inexpert technic or other conditions not related to the solutions. Until there is a broad clinical test by the "blind" method to rule out many of the factors which may enter, these debates will continue without a satisfactory solution.

It was felt that the situation might be improved if there could be obtained from manufacturers complete information with respect to the chemical composition and the physical and biologic properties of these local anesthetics, and the methods used to control these factors. These data may turn out to have no exact significance, but the desirability of having such data available is apparent if a satisfactory position in respect to this whole problem is to be reached. The secretary of the Council was therefore directed to request from the manufacturers of local anesthetic solutions information on the method used to control the isotonicity of their solutions, the actual figures for isotonicity obtained by biologic and physical methods and the $p_H$ of these solutions at the time of preparation and at intervals thereafter.

### INTRAVENOUS MEDICATION WITH SOLUBLE BARBITALS

In 1931, the Council issued a report on intravenous medication. At that time, there was being advertised to both surgeons and dentists a soluble barbital to be used as a basal anesthetic by injection into the veins. The Council's report pointed out that the routine administration of medicaments, particularly the barbitals, by this method was fraught with danger.

In the case of barbitals, it is known that once an overdosage is placed intravenously in the circulation, there is no known method of recalling the drug, and, at that time, nothing had been found which was effective as an antidote in case of untoward effects from the administration of such products.

Owing undoubtedly to the introduction of other soluble barbiturates and the frequent occurrence of enthusiastic reports in the dental literature, dentists write to the Council concerning these drugs. It may be pointed out that these enthusiastic reports as a rule contain no reference to the undesirable reactions, collapse and even deaths caused by such administration.

The Council held that the position expressed in the article on intravenous medication[2] and the uses and abuses of barbital[3] were still applicable to the present situation.

The Council again points out the undesirability of the routine use of soluble barbiturates as a basal anesthetic and suggests that, for their own and their patients' protection, dentists refrain from using these agents, until after evidence has been submitted to and accepted by the Council which will indicate that such anesthesia is a safe procedure.

### ANTISEPTIC AND RELATED TERMS

The attention of the Council was directed to the inaccurate use of "antiseptic," "bacteriostatic," "germicidal," "disinfectant," and related terms in dental literature. As an

2. J.A.D.A., 18:1787-90 (Sept.) 1931.
3. J.A.D.A., 18:151-55 (Jan.) 1931.

extreme instance, the use of the term "antiseptic solution" may be mentioned. When a practitioner desires to mention an irrigating solution, it is commonly referred to as an "antiseptic solution."

These terms have different meanings and each properly used is intended to have an exact and explicit connotation. The different meanings have been perverted by ill-usage. It would be in the interest of the advancing educational status of both the medical and the dental profession if, in the use of these terms, the literature adhered more closely to the correct meanings. The different shades of meaning expressed in the foregoing terms are well known to experts, but their misuse has given rise to a great many misconceptions.

Consequently, it was felt desirable for a member of the Council to undertake the preparation of a report setting forth the common terminology and limits of that terminology in bacteriologic references in medical and dental literature.

### DENTIFRICES

The Council's discussion on dentifrices revolved principally around the use of sodium perborate *per se* and its use in dentifrices, particularly tooth powders. The indiscriminate use of such products has led to the frequent appearance of untoward effects such as burns of the mouth, edema of the lips and conditions which might develop in their wake.

Consequently, the Council adopted the report of one of its referees that (1) sodium perborate shall be considered solely as a medicinal agent and not as an agent for oral hygiene use; (2) manufacturers of tooth powders or pastes containing sodium perborate who submit their products to the Council shall be required to furnish evidence that the dentifrice is more efficient because of its presence, and (3) the Council holds that the indiscriminate use of sodium perborate alone or in tooth powder or tooth paste in the daily hygiene of the mouth, except under close medical or dental supervision, is contrary to the interests of the user.

The Council has been assured of the cooperation of those manufacturers whose products are now listed in A.D.R. as containing sodium perborate that steps will be taken to remove it, in order that the products may remain acceptable.

A report outlining this position more in detail will be presented at a future date.

# BUREAU OF PUBLIC RELATIONS

## ORAL DISEASES IN CHILDREN*

By CLIFFORD G. GRULEE, M.D., Chicago, Ill.

IT must seem amusing to a group of dentists to have a mere pediatrician talk to them on such a subject as this; a subject about which they must know more than he and in which they are vitally interested. In such a gathering, the pediatrician must, therefore, confine his remarks to his own viewpoint. This viewpoint necessarily means a comprehensive view of the child in which the mouth condition is merely incidental. The diseases of the mouth may, of course, be primary conditions, but they are to him simply a part of the whole. It is such a viewpoint that I should like to impress on you: the necessity for regarding conditions occurring in the mouth as a part of the general picture of disease. Perhaps you do this more than I know, but often in these days, when we lean so much toward specialism, the wider outlook and broader conception is frequently lost. I shall leave you to answer the dental questions and shall consider only those which have to do with other phases of the subject.

It is difficult to know where to begin and where to end in taking up a subject like this. One might say that the conditions could be divided into two groups: those that were oral *per se* and those that were simply a part of the picture of a general condition; but it is not easy to say where the one begins and the other leaves off. We know, for instance, that stomatitis may be a manifestation of cardiac disease and that the lead line on the gum indicates lead poisoning. There are other points to be brought out. How many of the conditions in the mouth are the result of general malnutrition or secondary to it? I shall take the various age periods of the child and try to indicate what conditions are commonly met with there and how we should go about caring for them from a general and sometimes a local standpoint.

The inspection of the mouth is of interest immediately the child is born. We usually find that the median raphé is a yellow beaded streak along the roof and that on each side of it slightly yellowish or white epithelial pearls are to be seen. These are not of any pathologic significance and soon disappear. All we need to know is that they are within the normal. More frequently in the days gone by, on the second or third day, we would find superficial ulcers on each side of the junction of the hard and soft palate. These ulcers are sometimes surrounded by a small, thin layer of necrotic tissue and occasionally such an ulcer is found on the roof of the mouth in the median line. They are known as Bednar's aphthae and are definitely traumatic in

*Read before the Section on Medical Relations at the Seventy-First Annual Midwinter Clinic of the Chicago Dental Society, Feb. 21, 1935.

origin. The ones on the palate are due to mistaken attempts at cleansing the mouth with gauze.

We do not realize how delicate is the epithelial surface of the mouth and how easily this can be denuded, ulcerations following. The ulcer in the roof of the mouth is frequently due either to attempts at cleansing or to pressure from too large a bulb on the rubber nipple which is used in giving the child water. It is infrequent to see a true stomatitis at this time. In fact, I never remember having seen it. We should always remember that the mucous membranes of the mouth of the newborn are thin and consequently somewhat redder than in the mouth of the older child. It is common at this age, as later, to see on the tongue and cheeks fine white flecks which it is rather difficult to remove. It is sometimes rather hard to distinguish at first glance whether these flecks are milk curds, but, unlike milk curds, these flecks are tightly attached to the mucous membrane and, on being removed, may leave a small abrasion.

This, of course, is the well-known condition thrush. If recognized, it may easily be treated and recovery is rapid. On the other hand, if neglected, the condition may become in rare cases extremely serious, extending down the esophagus and out of the mouth. In rarer instances, in older persons, if the condition has existed for some time, a marked resistance seems to be developed on the part of the organism and, as a consequence, even large areas of the skin may be affected and treatment may be almost impossible. A point that is sometimes overlooked in the treatment of these cases is the danger of repeated reinfection in the breast-fed child who has thrush. Of course, there are deposits of *Monilia albicans* on the mother's nipple and, if these are not removed, they act as a source of reinfection, so that, in treating a nursing baby with thrush, we must not only care for the condition within the mouth, but must also carefully sterilize the nipple with boric acid before and after nursing.

Many forms of treatment for thrush have been effective. That which is least irritating is probably best. The principal thing to be emphasized is that the treatment must be continuous and the child's mouth cleansed frequently. Because of the delicacy of the tissues, it also must not be cleansed too vigorously. Thrush is a condition which is often found in later infancy. The younger the infant, the more necessary prompt measures to overcome the condition.

I shall mention a few other conditions which may be encountered in the newborn. Tongue tie can be passed on without further mention except that, far too frequently, it offers an excuse for surgical interference. Precocious dentition is occasionally met with. Rarely does this consist of true actually formed teeth, but more often of tissue which takes on the form of a tooth, but has no dental material in it. These are usually confined to the location of the lower central incisors, have a distinct consistently pinkish hue and a rubbery consistency and are cast off in a few days. Another condition which is occasionally met with is tooth bud infection. If we may generalize from Poncher and Blayney's[1] work, we may regard this as secondary to nasal infection. At this age, the condition is a serious one, frequently calling for surgical interference.

We turn now from the newborn infant to the infant somewhat older. We find that disease conditions in the mouth are rarely met with until after dentition begins. With the beginning of dentition come the numerous conditions which may

1. Poncher, H. G., and Blayney, J. R.: Am. J. Dis. Child., 48:730 (Oct.) 1934.

or may not be regarded as secondary to that physiologic process. The condition which down the ages has aroused the greatest amount of interest and controversy is associated with this process. Teething has been blamed for everything that may happen to a child at this age, from ill-nature to convulsions. I think we may safely say that teething frequently is a painful process and likewise it frequently produces an increase in the flow of saliva, which is spoken of as drooling. Secondary to these primary symptoms, we have, of course, a certain amount of peevishness on the part of the child and likewise a refusal to take all of its food. After the tooth has pierced the gum, these symptoms disappear.

It seems unreasonable to say that teething is responsible for fever, convulsions, or many of the numerous other conditions that have been ascribed to it. That febrile conditions may occur rather frequently at the time of teething as a result of reduction of the child's resistance is possible, though I think this theory is untenable. It is a notable fact that, with the introduction of cod liver oil as a routine food for children, the number of cases of convulsions have very materially decreased. We rarely hear of teething being associated with this condition now. If the child were on the verge of an outspoken manifestation of spasmophilia, the pain of teething may have tipped the scales.

Another condition which was seen in infants past 6 months of age more frequently previously than now is scurvy, which, in these infants, is associated primarily with a certain amount of reddening of the gums, the latter becoming spongy and soft and taking on a purplish hue. As the condition advances, there appear at the base of the incisor teeth small, purple sacks which are really hemorrhagic areas. The child becomes cross and irritable and frequently shrieks when handled; which is so contrary to the usual reaction that it should at once be associated with pain in the extremities and should lead one to think of scurvy or some like affection. The symptoms of scurvy disappear rapidly after the introduction of treatment. Within four days after orange juice is given in sufficient quantities, the pain has ceased, the appetite increases and, if orange juice is continued, the child goes on to complete recovery. Other common conditions of infancy are met with so much more frequently in children over 1 year of age that they will be discussed together.

We come now to a group of conditions which have usually been regarded as local, that is, the condition of the mouth has been considered primary and any general symptoms secondary. In most instances, this assumption is not justified. I refer here to the various forms of stomatitis. The most frequent and less serious of these is aphthous stomatitis, which begins as an inflammatory condition with reddening of the mucous membrane, followed soon by punched-out ulcers which appear to be quite white. This is the condition which in my boyhood was spoken of as canker sores. It has been attributed to various conditions, but actually its nature and its cause have never yet been determined. It is rather frequently associated with constipation and the relief of that condition is one of the first things to be thought of in its treatment. The condition frequently disappears without treatment, but healing may be promoted by the application of 4 per cent potassium chlorate solution to the ulcer.

Another form of stomatitis which is usually mentioned in textbooks is the ulcerative type. In this condition, there is necrotic tissue at the gum line and sometimes in other portions of the mu-

cous membrane. There is a very foul odor and the affected tissues bleed easily when the necrotic tissue is removed. There is not a sharp division line between this and gangrenous stomatitis, nor between gangrenous stomatitis and noma. If such a division line exists, it is very hard to determine. Necrotic or ulcerative stomatitis frequently has gangrenous areas, while gangrenous stomatitis, if it goes on to the condition known as noma (a sharp demarcated gangrenous area affecting the entire thickness of the cheek, lip or corner of the mouth), really presents simply an advanced form of gangrenous stomatitis.

Fusiform bacilli have been intimately associated with all three conditions. They are found in the tissues of the gangrenous area in noma. There is a grave question whether such organisms can be regarded as primary. In a recent article by Krasnogorski,[2] there are recorded results which have been obtained purely by dietetic treatment without application of mouth washes or any internal therapy. The treatment with which he had success consisted of cabbage juice, cream and curds or cottage cheese.

There is much to be said for his point of view. The condition is practically never seen in private practice and is of rather infrequent occurrence in dispensary practice among the very poor. The advanced form, noma, occurs only in children who have been extremely depleted; usually, by some of the abovementioned diseases, especially measles. It would seem more rational to approach this condition from a dietary angle than to use arsphenamine and other arsenicals intravenously with the idea of destroying the fusiform bacilli. Certainly, the child's general condition must be built up to combat the infection, and it is doubtful that such infection is primarily from fusiform bacilli. In the ulcerative type, antiseptic mouth washes are of value.

Another condition which we rather frequently find in children is so-called Vincent's angina. A membrane appears on the tonsils and pharynx, and often on the gums, tongue or cheek, in neglected cases. This at first is white and later becomes a dirty yellow or even black and necrotic. The condition is associated with an angina which is very painful and by general symptoms such as a rise in temperature. The child is never so much prostrated as when it is suffering from diphtheria, from which the condition must be differentiated. In this membrane, we find again fusiform bacilli, and the condition reacts to the application of solutions of arsphenamine or other antiseptics. Here too, the general condition must be looked to. There may be no great depletion in general nutrition of the child. Vincent's infection is found in all walks of life. It should always be remembered that diphtheria can affect the mouth as well as the throat, and whenever a membrane is present, a bacteriologic examination should be made. One should never forget that in children ulcerations in the mouth may be the direct result of the use of escarotics. More frequently than now, we used to see lesions in the mouth as the result of children taking lye. Diagnosis in such cases can be made as a rule from the history, but one should always remember that such conditions do exist and consider them when ulcerative processes are present.

We turn now to a group of cases which are much more definitely associated with general disease. In the first group, we should consider the acute exanthems or, better perhaps, the acute contagious diseases. In most of these, there is some

2. Krasnogorski: Kinderarztl. Praxis, 6:10, 1935.

manifestation of the disease in the oral cavity. In measles, the well-known Koplik's spots are found. These minute white specks, surrounded by a bluish area, are usually found on the inner side of the cheek twenty-four, forty-eight or as long as seventy-two hours before the appearance of the rash on the skin. They are definitely diagnostic and of great importance. The well-known strawberry tongue is present in scarlet fever. In this condition, the papillae of the tongue stand out as small cysts surrounded by, or rather projecting through, a membrane. In chickenpox and smallpox, there may be lesions within the oral cavity; while, in mumps, the orifice of Stenson's duct may be red and swollen. In whoopingcough, as the result of the cough, with projection of the tongue, there may be ulceration at the base of the frenum where the tongue rubs against the incisor teeth.

The next group of cases is that which is associated with changes in the blood. The lesions in the mouth are not necessarily suggestive of agranulocytic angina, as the ulcerous condition in the throat may occur in several disease conditions. The diagnosis cannot be made except by the blood count, which shows a very great depletion or absence of the polymorphonuclear leukocytes. This condition is rare in children, which may be explained by the fact, recently recognized, that it is often associated with the administration of coal tar remedies. In lymphatic leukemia, one also finds ulcerative stomatitis, which is especially likely to occur in the region of the tonsils or the pharynx. The diagnosis here too is to be made by examination of the blood. It should be borne in mind that lymphatic leukemia is the type most frequently encountered in children. Another condition in which an angina may be met with is the rather rare aplastic anemia. Purpura too may show lesions in the mouth. Chronic metallic poisoning may have definite oral manifestations. During the period that bismuth injections were given so freely in bone and joint tuberculosis, it was not uncommon to see bismuth poisoning in the child patients which showed a deposit at the gum line that was dark gray or bluish. A more common condition and one already mentioned is lead poisoning, which is not at all uncommon in children today. In this country, it results as a rule from eating paint from toys or enamel from beds. The lead line on the gum here too is important, and it is interesting to note that the diagnosis may be confirmed by roentgenograms of the ends of the long bones, lead being deposited at the epiphyseal line and giving a very definite shadow. In Japan, where this condition is much more prevalent, in virtually all cases nursing babies are the ones affected, as the result of the use by the mothers of large quantities of a cheap powder which is made with a mixture of lead. It should be noted that sometimes the condition is associated with encephalitis. Arsenical and mercurial stomatitis may be seen in syphilitic infants, but the diagnosis under these conditions is usually not hard. I shall not go into the lesions which are to be found in the mouth in syphilis, tuberculosis and actinomycosis because these are probably familiar to you. Nor will I more than mention stomatitis, which comes with such general conditions as cardiac decompensation.

I now approach a subject which perhaps is as much discussed as any in medicine today, dental caries. My knowledge of this subject is largely the result of my having endured two and three hour debates by eminent men as to whether the condition were bacterial or dietetic in origin. I do not profess to be able to decide this, as many more competent than I have come to the conclusion that the

question is not yet in the stages of final solution. I should like to approach the subject of dental caries in children from two standpoints: first, as to what dental caries does to the child and, second, as to what etiologic factors are to be considered at this age. Much has been said and written about the effect of dental caries in children. In the first place, it has always seemed to me, and I think the experience of others bears this out, that it is rather unusual to see an endocardial lesion develop as the result of apical infection following caries in a child. In the second place, toothache, as we all know, does have a deleterious effect on the child if only from the standpoint of the pain. It too would seem to interfere for this reason with proper mastication of food and even might result in the refusal of food which required mastication. It seems to me that dental caries, like teething, in these children is of interest not because of the direct effects of the condition, but because of the secondary symptoms which may result. It seems that too much stress has been laid on the caries and too little on the child. I know very little about dental caries, but I profess to know something about child nutrition, and I would question greatly the narrowness of the outlook which has frequently been evident in work along this line. In other words, different children require different foods, and it is not at all certain that nutrition is definitely influenced in all instances by the type of food which the child takes. For the consideration of metabolism, which, after all, is all that counts, the contents of the alimentary canal may be regarded as outside the body. It is therefore only that which is absorbed from this canal which is of any value to the organism as a whole, and what is absorbed in the individual instance, we have very little means of determining. This is especially true of vitamins. Not only do we not know under what conditions and in what quantities vitamins are absorbed into the organism, but we do not know how much of the vitamins are required. Nor do we know definitely whether an excess of vitamins is detrimental. But even if we knew all these things, we would not know the effect of bacteria on the intestinal content, nor would we know the effect of absorption on the bacteria. The problem is an extremely complicated one. It is not to be answered by a few animal experiments, and it can be answered only when sufficient evidence is available that dental caries is only and always associated with certain phenomena which will, in all probability, be found to be interdependent. In the present state of our knowledge, we can only say that children's mouths should be kept clean; that a good general diet with an ample supply of all the various vitamins should be provided, and that a good diet presupposes plenty of calcium and phosphorus, but giving calcium or phosphorus alone most certainly will not remedy the condition. Why some children are caries immune, and in others of apparently just as good nutrition, the teeth break down one after another, has not yet been satisfactorily explained. The solution to these problems must be obtained by teamwork. Not by the dentist who knows caries alone, nor the pediatrician who knows the general condition of the child, but knows little or nothing of caries, can we expect to effect a definite answer. It is only by combining efforts and taking a broad view of the problem that we will finally arrive at a solution.

# RELATION OF TOOTH EVENNESS TO PERFORMANCE ON THE BRASS AND WOODWIND MUSICAL INSTRUMENTS

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THAT the problem of detecting the potentialities of each individual child is a matter of increasing concern to the educator of today is evidenced by the development of tests and measurements during the past decade which have for their objective the determination of certain capacities. One of these conditions, of concern to the dentist as well as to the student and teacher, is teeth evenness and its relation to successful performance on certain musical instruments. Many statements of this relation have appeared from time to time in publications written as aids to bandmasters in our schools. The following quotations are typical: "All brass players need even front teeth."[1] "Irregular teeth militate against success with a cup-mouthpiece (brass) instrument, but are no handicap on reed (woodwind) instruments."[2] The following statements are not so unequivocal, being somewhat qualified: "Some little fellow with uneven front teeth . . . will have a hard time playing an instrument which has a small cup mouthpiece . . . but he might become a wonder on the clarinet."[3] "The trumpet player must have thin lips and regular teeth. Those with thick lips and irregular teeth can play baritone and bass horns. (The trumpet, baritone, and bass horn are all brass instruments.) If the teeth are too irregular, they can play reed instruments such as the clarinet and saxophone."[4] In contrast to the last sentence, we quote another: "Reed instrument players must have even lower teeth."[5] Another writer states that "those . . . with badly overlapping teeth were assigned (by him) to piccolos, clarinets and saxophones" (the more commonly used woodwinds); whereas, if they had "good even teeth," they were assigned to "cornet, trombone or some other brass instrument."[6]

The apparent variance in these quotations is what might be expected in view of the fact that they do not seem to be supported by experimental evidence, and hence are but statements of varying impressions of the respective writers. The natural query to the reader of these varying statements is which of them, if any, are true, and to what degree, if but partially so.

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1. Maddy, J. E.: School Orchestras—How They May Be Developed, New York: National Bureau for the Advancement of Music, p. 7.

2. Wright, Z. P.: What Instrument? Cleveland: H. W. White Co., 1927, p. 5.

3. Keeler and Stites: Making the High School Band, Cincinnati: Rudolph Wurlitzer Company, p. 5d.

4. School Band and Orchestra, Elkhart, Ind.: Pan-American Band Instrument and Case Co., 1929, p. 15.

5. Maddy, J. E.: School Bands—How They May Be Developed, New York City: National Bureau for the Advancement of Music, p. 10.

6. Innes, F. N.: Musical Possibilities of Wind Band in Progress in School Music, Elkhart, Ind.: Pan-American Band Instrument and Case Co., p. 15.

As a means of expressing a relation between any two variables, the statistical concept (coefficient of correlation) is employed. Through it, the relation between tooth evenness and brass aptitude may be expressed in the form of a decimal fraction. If the relation between the two variables is perfect, one increasing or decreasing uniformly with the other, the coefficient is 1.00; whereas, if there is no relationship between the two variables, the coefficient is 0.00, i.e., zero correlation. Intermediate degrees of correlation naturally are expressed in the form of decimal fractions between these limits. In order to calculate a coefficient of correlation, a means for scoring each of the two variables must be provided. Such means were developed in conjunction with an experiment carried on by one of us (C. J. L.)[7] over a period of four years and including 151 subjects.

As the object of this experiment was the determination of aptitude for brass, string and woodwind musical instruments, the means for measuring these aptitudes objectively were developed in the form of aptitude tests, one for each type of instrument. In order that these tests might be truly objective, they were given to the subjects of the experiment as a culmination of a controlled try-out or exposure to the type of instrument in question. The experiment was conducted in accordance with a definite procedure, which included preexposure testing and measuring, especially prepared instructional materials to which the subjects of the experiment were exposed or tried out in a prescribed manner for a definite period, and the above-mentioned aptitude tests given at the close of the exposure.[7]

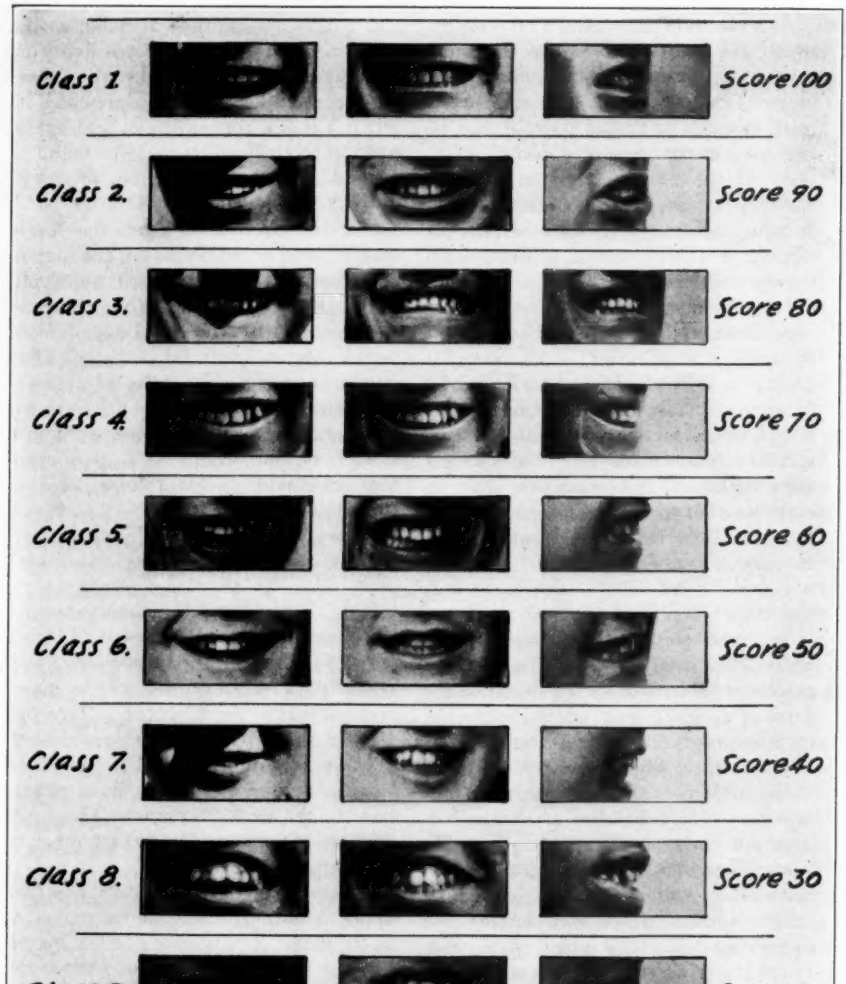
With a means of scaling brass aptitude and woodwind aptitude at hand, as the experiment proceeded, the possibility of determining the relation between these aptitudes and tooth evenness presented itself if a means for scoring or scaling degrees of tooth evenness could be found or devised. For this purpose, one of us (F. W. E.) was consulted.

For the purpose at hand, the Angle classification of malocclusion, familiar to orthodontists, seemed to be quite unsuited. First of all, the teeth with whose evenness we were concerned were limited to the anterior teeth, i.e., from cuspid to cuspid inclusive. Secondly, the above-mentioned classification was not intended to serve as a graduated objective measure or scale of tooth evenness. A tooth evenness scale was therefore constructed in the following manner:

Three pictures of the front teeth of each of sixty-two subjects (students) were taken by an expert photographer, using a 3¼ by 4¼ inch Graphlex extension bellows camera, at a distance of 34 inches from the lens. The pictures showed successively (1) a front view of the upper and lower front teeth parted, (2) a front view of the upper and lower front teeth in contact as in biting, the lips being held away from the teeth and (3) a profile view of the teeth in contact. These pictures were mounted in sets of three to facilitate analytic study.

The next matter of concern was that of the determination of an objective basis for initial classification of the subjects' teeth as to relative evenness. All of the subjects were beyond the age of puberty, being from 14 to 15 years of age; hence, the second dentition (permanent set) of the teeth considered was complete. Furthermore, as the subjects' ages were limited in range to one year, the safe rate of tooth movement for correcting faulty alinement was the same for all of the subjects. Therefore, the number of

7. Lamp, C. J.: Determination of Aptitude for Specific Musical Instruments, unpublished doctoral dissertation, University of California, 1933.




Lamp scale of tooth evenness.

months of orthodontic treatment needed for correcting unevenness was a true objective means for the initial classification of the pictures into groups. For scoring convenience, a scale of 10 degrees of evenness, i.e., ten groups, was chosen. In the process of classification, no attention was paid to the type of arch represented, whether broad and approaching the circular form, or narrow and approaching the elliptical. It was assumed that the ideal alinement for wind instrument performance was a close approximation of the individual subject's teeth to the curve or arch form that was normal for that person. As is well known, there are no perfect arches. Nature seems to have a pattern that she strives to attain, but never quite reaches. The task of initial classification was therefore to divide the sixty-two dentures into ten groups of increasing departure from so-called normal, using as a basis the average time in months required by an orthodontist to place the teeth in question in reasonably correct alinement. All cases requiring the same average time were placed in the same group. From each of the ten groups thus formed, one set of pictures was selected as typical of the group. The ten sets selected were then remounted, being placed in the order of evenness, thereby constituting a scale of tooth evenness, as shown in the accompanying photograph.

The sets of photographs not included in the scale were now reclassified, the scale being employed as a guide in scoring. Such cases as required no orthodontic treatment were reclassified on the basis of natural evenness and fell largely into classes 1 and 2. The former cases were scored 100, the latter 90. Such cases as required treatment were reclassified, from the most nearly even to the least. This process naturally placed mutation cases and congenitally missing cases in classes 9 and 10, it being evident that treatment could not correct what was not provided. The scale permitted a more equitable and objective means of scoring, particularly for such cases as more truly fell between two consecutive classes. For example, a case not good enough to be allotted to Class 3, but better than Class 4, was scored neither 80 nor 70, but was interpolated between them, i.e., 75.

After each case had been properly classified on the scale and scored accordingly for tooth evenness, correlations were determined statistically between the tooth-evenness scores and the brass aptitude scores and between the tooth-evenness scores and the woodwind aptitude scores. The following coefficients of correlation were obtained:

Tooth evenness vs. brass score . . . . . $r = -0.01 \pm .095$
Tooth evenness vs. wood-wind score . . . . . $r = +0.13 \pm .090$

For readers who are not familiar with statistics, and hence with the significance of the preceding coefficients, it might be well to explain that, whereas correlation coefficients vary from 1.00 (perfect correlation) to 0.00 (zero correlation), values below 0.70 are too small to serve as a basis for individual diagnosis or prediction. The preceding coefficients are both far below this minimum. In fact, they are virtually zero and therefore indicate that there is no relationship between tooth evenness and successful performance on the brass and woodwind musical instruments. It is amusing to note that these correlation coefficients are no higher than the coefficient found between tooth-evenness and string score, i.e., $r = +0.16 \pm 0.10$, a case in which tooth evenness is obviously irrelevant.

These findings are quite interesting, being so sharply at variance with the commonly accepted opinions which are

quoted in the opening paragraph of this article. The opinion as to lip thickness being a factor in the selection of the size of mouthpiece, thin lips being requisite for successful performance on horns having small mouthpieces, and thick-lipped students being therefore allotted horns with large mouthpieces, found some support in the evidence of the above-mentioned experiment,[7] but not to the degree that is commonly accepted, as the partial correlation between lip thickness and mouthpiece diameter with brass performance held constant was found to be only + 0.275. Lip texture and musculation seems to be the important factor in the selection of mouthpiece diameter for successful performance on the brass instruments.

As over seven years have passed since the tooth pictures were taken, it is of interest to note that the subjects whose teeth are shown on the scale of tooth evenness as typical of classes 2 and 3 have risen into prominence as performers, as have also the students whose sets of teeth are shown as typical of classes 9 and 10. The latter have demonstrated outstanding brass performing ability as players of the French horn and trombone, respectively. These instances are normal, when viewed in the light of the evidence relative to tooth evenness set forth in this article.

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## TEETH AND THEIR CARE*

(The introductory remarks should be short, cheerful and appropriate. As this talk is prepared for children of school age, simple, direct statements, setting forth the object of your visit and the subject of your lecture, are all that is required.)

(Slide 1.)

First of all, as you have learned in school, everybody has two sets of teeth. Our first set of teeth are called "baby," "deciduous" or "temporary" teeth. "Baby teeth" is a good name, because it is easy to remember. "Deciduous teeth" is the proper name for the first set of teeth, and it is the term dentists use in speaking of baby teeth. "Deciduous" may be a new word for you, so let us spell it: d-e-c-i-d-u-o-u-s. It means "falling off." The first set of teeth fall out when they are replaced by the permanent teeth. Ask your teacher to explain more fully the word "deciduous."

The deciduous front teeth, the incisors, should remain in the mouth until you are between 6 and 8 years old. They are then replaced by the permanent incisors. The deciduous molars should stay in until you are between 9 and 11 years old, at which time they are replaced by the bicuspids of the permanent set. The deciduous cuspids are replaced by the permanent cuspids at about 12 years of age.

(Slide 2.)

The permanent teeth form beneath the deciduous teeth. The permanent teeth start to form when you are about 1 or 2 months old. It takes about five or six years for the permanent teeth to become large enough to push the deciduous teeth out of the mouth. As they grow larger, they push against the roots of the deciduous teeth and make those roots dissolve and disappear. When the permanent teeth have grown large enough to take their place in the mouth, they simply push the crowns of the deciduous teeth right out of the gums.

*A stereopticon slide lecture for fifth to eighth grades.

If you are 11 or 12 years old, you probably have lost all of your deciduous teeth. So, as far as your health is concerned, you may not be interested in their care. But you may have younger brothers and sisters and you are interested in their health. I should like to have each one of you make yourself a monitor or caretaker for your younger brothers and sisters. Make it your business to see that their deciduous teeth do not decay. If they should, make it your business to have them repaired.

Many people think that it is not necessary to care for deciduous teeth. That is a wrong idea. Deciduous teeth do need attention. There are four good reasons that deciduous teeth should be cared for:

1. They are used to chew your food during that period in life when you are growing and developing by leaps and bounds. If the deciduous teeth are allowed to decay, you cannot chew your food properly. If you cannot chew your food properly, you cannot grow into a strong boy or a strong girl.

2. Deciduous teeth are important because they help to form sounds of certain words and letters. If they are decayed or broken down, you cannot speak properly.

3. When teeth become decayed, germs burrow down through the crown to the end of the roots. There the blood stream may pick up the germs or the poisons which they give off and carry them to other parts of the body. When this happens, serious illness, such as heart disease, kidney trouble or rheumatism, may result.

4. Deciduous teeth act as guides for the permanent teeth that form beneath them. If a deciduous tooth is lost before it should be, the other deciduous teeth may perhaps move a little in the jaws, which may cause one or more of the permanent teeth to come in crooked. Many children have crooked permanent teeth because the deciduous teeth were lost too soon.

(Slide 3.)

I want to call your attention to this tooth (pointing) that is still in the jaw bone. It is called the sixth year or first permanent molar. This tooth starts to form when you are about 1 to 3 months old. For six years, it grows larger and larger as food is brought to it by the blood. When it gets large enough, that is, when you are about 6 years old, it pushes through the bone and the gum and takes its position in the mouth back of the deciduous molars. If you are over 6 years old, you probably have all your first permanent molars. You should have four of them, two in the upper jaw and two in the lower. Tonight after school look in a mirror and see whether your first permanent molars are there. They are the sixth tooth back from the front center of the mouth.

The first permanent molars are the most important teeth in the mouth, because they hold the other teeth in their proper positions. Many times, your first permanent molars are poorly formed, owing probably to the fact that when they were forming you did not eat the right kind of food. As soon as the first permanent molars come in, it is wise to have the dentist examine them. If the dentist finds any weak spots in the enamel covering, he can repair them and save the tooth from decay.

(Slide 4.)

This is a set of permanent teeth. As you will remember from what you have learned in school, there are thirty-two teeth in the permanent set: eight teeth in the upper jaw on one side, eight teeth in the lower jaw on the same side; which makes sixteen on the one side and sixteen on the other. This is the upper first permanent molar and this is the lower (pointing).

These are the upper and lower twelfth year or second permanent molars (pointing). If you are about 12 years old, you are getting your second permanent molars right now, for that is the age when those teeth come in.

Like the first permanent molars, some of the second permanent molars are sometimes

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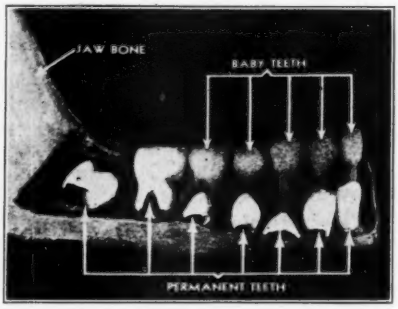


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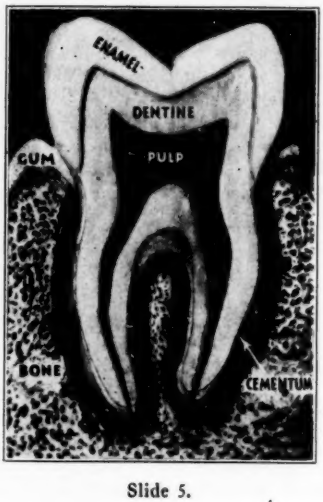



Slide 5.

Slide 6.

weak and poorly formed when they first come through the gums. Therefore, it is wise to have them examined and, if necessary, repaired by the dentist as soon as they come into your mouth.

The third molars are often called wisdom teeth. You don't get your wisdom teeth until you are about 17 to 21 years old or sometimes even a little older.

I would like to have you look in a mirror and examine your own teeth. You will notice that the teeth have different shapes. They have different shapes because they have different work to do. The front teeth are used to bite off small mouthfuls of food so that you can chew it. When you close the jaws, the upper and lower front teeth come together like a pair of scissors. Therefore, the front teeth are called incisors.

The teeth at the corner of the mouth are called cuspids. They have one sharp cusp. Some people call them canine or "eye" teeth. They are used to tear coarse foods. If you want to chew or tear anything tough, you will instinctively put it in the corner of the mouth and use these cuspid teeth for that purpose. The cuspids have very long roots which are held solidly in the jaw bone.

Back of the cuspids in the permanent set of teeth are the bicuspid teeth. The bicuspids take the place of the deciduous molars in the first set. They are called bicuspids because they have two cusps. The upper and lower bicuspids come together much like a nut cracker and help to crush food.

Immediately behind the bicuspids are the molars or "millers." They are so made that, in chewing, the cusps or points of the upper molars fit into the grooves or pits of the lower molars, thereby crushing and chewing the food into fine particles and mixing it with saliva so that it can be swallowed.

Even though teeth are shaped differently—because they have different work to do—they are all made very much on the same plan.

(Slide 5.)

This is a lower molar tooth. It has two roots. If it were an upper molar tooth, it would have three roots. Front teeth have only one root. Each tooth has a crown, which is the part that you see when you look in your mouth. Also, each tooth has one or more roots. The roots hold the tooth in the bone. This narrow part is called the neck. That is where the gums form around the crown.

The crown is covered by enamel, which is the hardest substance in the body. It is also very brittle. If you bite hard things, like thread, or if you chew the metal end of your pencil or if you crack nuts, you are liable to crack the enamel. Once the enamel is cracked, the tooth may decay very easily. The root of the tooth is covered by cementum, which helps to hold the tooth in the jaw bone.

If we had an instrument such as is used in dental colleges, we would be able to cut one of these teeth in two. Then we would see what the inside of the tooth looks like. This (pointing) is the enamel covering on the crown. It protects the tooth from outward injury when we chew our food. This is the cementum covering on the root. Inside the enamel and the cementum, we find the body of the tooth. It is made of a substance called dentin, which is about as hard as bone and much softer than enamel. In the center of the tooth is a hollow space called the pulp chamber. It is filled with a soft tissue called the pulp. You might call the pulp the life or the heart of the tooth because in the pulp we find the blood vessels and nerves which keep the tooth alive.

The arteries enter through small openings in the end of the root and carry food to the tooth. The veins leave the tooth at the root end and carry waste products away. The nerves also enter at the root end. They carry sensations of heat or cold or pain such as you have when your tooth aches. Every one of the twenty deciduous teeth and the thirty-two permanent teeth are live members of your body. It is your job to keep them alive and healthy so that they can work for you.

I like to compare teeth with the knights of olden days—you know, the knights of the round table. How did those knights protect themselves from their enemies? (Get an answer from the class.) That's right, they covered themselves with armor. They would travel miles and miles to some old armor-maker, a man who had the reputation of making a good suit of armor, in order to get the best possible steel to cover and protect themselves.

Our teeth are like knights—white knights—every day they perform good deeds for us. We must protect our teeth with good armor. The armor of the teeth is not made of steel—it is made of enamel, which is made of lime and phosphorus. Therefore, we must eat enough lime and phosphorus containing foods so that we can build good strong enamel armor for our teeth. We need the best possible enamel armor to protect the teeth from our enemies, germs.

After providing themselves with good armor, what did the knights do to keep in good condition? (Get an answer from the class.) They shined it. They kept it cleaned and polished it so that it shone like a mirror. They knew that if they did not keep their armor clean, rust would eat small holes in the steel and weaken it. Then their enemies' battle-axes or lances could easily penetrate the weak spots.

The same thing is true of the enamel armor on the teeth. We must keep it clean and polished because we are constantly fighting enemies in the form of germs. Wherever we are, germs are bombarding our bodies. They are bombarding the skin and the teeth, and the enamel armor on the teeth.

If the enamel armor on the teeth is not broken and has no decayed spots, and it is kept clean, the germs cannot enter. But if the enamel armor has holes in it, germs can enter the tooth. Once the germs have penetrated the enamel armor, unless they are arrested, they usually burrow through the soft dentin very rapidly and reach the pulp or heart of the tooth and kill it.

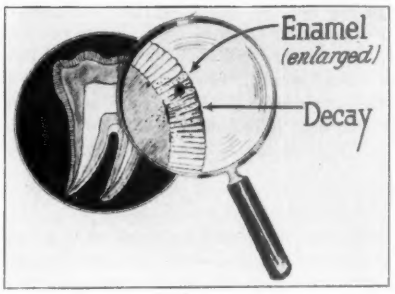
Besides building good armor and keeping it polished, what did those knights of old do to keep themselves strong and sturdy? (Get an answer from the class.) That's right—they exercised. Now, we must exercise the teeth to keep them healthy. The way to exercise them is to use them. Most people in America like to eat only soft foods such as bread and gravy, mashed potatoes, overly cooked vegetables, pies and cake. We get in the habit of eating soft foods. A little is all right, of course, but do not confine yourselves entirely to that kind of food. Eat some coarse foods also. Coarse foods exercise the teeth and gums.

Besides having strong armor and keeping it clean, and taking plenty of exercise, what did the knights do when they got into a battle and the enemy happened to run a lance or sword through one of their steel plates? (Get an answer from the class.) That's right—they patched it up, didn't they? They would have the old armor repair man fix it for them. Then they were ready to go back into battle again. You must do the same thing with the protective armor on your teeth. If, in spite of your care, you get a hole in your dental armor, go to the armor repair man, the dentist, and let him repair the enamel covering for you.

It is important for you to watch your teeth and their enamel covering. If you can keep that enamel covering free from decay, you will protect the teeth. You will prevent them from decaying. That is the point for you to remember. Any dentist can repair teeth after they are broken down, but *you* must care for them so that they will need little or no repairing.

(Slide 6.)

Sometimes, the molar or bicuspid teeth are not properly formed. They do not have the right kind of protective armor. This is probably due to the fact that you did not eat the right kind of food when those teeth were forming. They have cracks on their biting surface. Sometimes, these cracks are smaller than a toothbrush bristle. Those two

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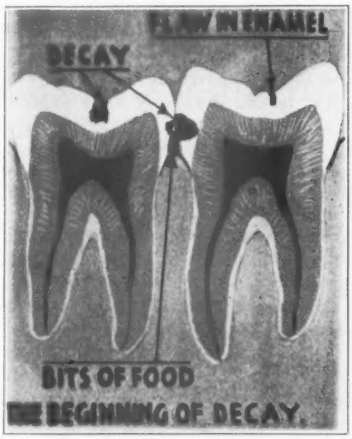


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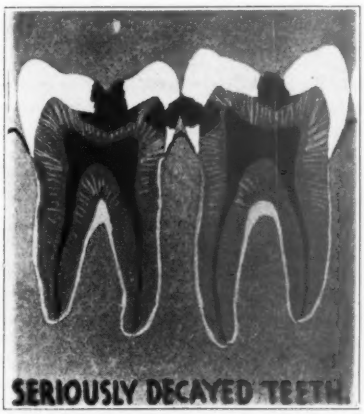


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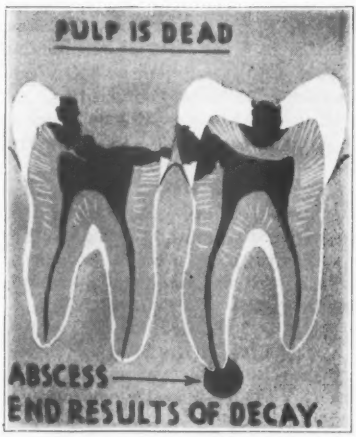


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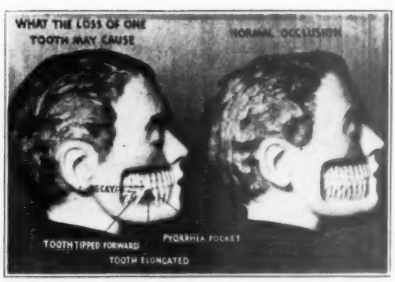


Slide 11.

HELP PREVENT DENTAL DECAY

1 NOURISH YOUR TEETH
2 EXERCISE YOUR TEETH
3 CLEAN YOUR TEETH
4 VISIT YOUR DENTIST
THREE TIMES A YEAR

Slide 12.

marks (pointing) are toothbrush bristles. You can see how much smaller the crack is than the toothbrush bristle. Even though you brush your teeth as carefully as you can, you cannot brush the food out of these flaws. That is one reason why you should have these teeth inspected as soon as they come into your mouth. If your dentist finds such a flaw, he can remove it and prevent the tooth from decaying. Have your first permanent molars inspected by your dentist at 6 years of age, your bicuspids at 10 or 11 years of age, and your second permanent molars at 12 years of age, because that is when those teeth come into the mouth.

(Slide 7.)

When we speak of the enamel armor covering each tooth, do not think of it as just being one flat mass of material. Enamel is made of millions of very, very small enamel rods that are securely held together by a cement which nature has made for that purpose. If you would hold a tooth under a microscope, you would see those enamel rods very plainly. If food is allowed to cling around the tooth, eventually it will decay, and decay germs will cause acids to form. The acids may eat away much of the cement from between the rods. Then the germs come down between these rods and into the softer dentin. Once the decay has reached the dentin, it progresses very, very rapidly.

(Slide 8.)

This drawing shows a longitudinal section of two slightly decayed teeth. The decay has just begun to attack the enamel armor of this tooth. If your teeth were decayed like this, you probably would not have any toothache, because the decay is very small. The best time to have your teeth repaired is before they ache.

Your dentist can remove these small decayed spots very easily, painlessly and inexpensively, and he can put in fillings to prevent further decay. If you do not go to your dentist at least every six months for inspection and care, the decay may get larger and larger, and, as you can see by this picture, in time will break through the enamel.

(Slide 9.)

If your teeth are decayed as badly as this one, you *will* have a toothache. When you eat anything sweet, hot or cold, you will get a sensation of pain. Your dentist can still save this tooth by cutting out the decay and putting in a large filling. It is much harder to save this tooth now than it would have been had you cared for it sooner, but it *can* be saved.

(Slide 10.)

If your teeth should be decayed as badly as this one, you would have a howling toothache! No dentist can save the life of a tooth as badly decayed as this one, because the decay germs have reached the soft pulp, or heart, in the center. He will have to remove the pulp and fill the pulp chamber with some filling material. Then, instead of having a live healthy tooth, you will have a pulpless or heartless tooth.

Many times, pulpless or heartless teeth may become abscessed. You all know what an abscess is—it is an infection at the root end of a tooth. The blood stream may carry some of the infection to other parts of the body, where it may cause heart disease or kidney disease or rheumatism.

This tooth (pointing) is so badly decayed that no dentist can save it, dead or alive. It must be pulled out. But you say, "What difference does that make? I have thirty-two teeth. If I lose one or two, I shall still have thirty or thirty-one left."

It does make a difference. (Hold hand with fingers extended in the light. Demonstrate, by bending middle finger down, how the remaining fingers spread.) Your teeth stand in your jaws much as my fingers stand, shoulder to shoulder, each one doing his

duty, each one supporting the tooth next to it. If one tooth is pulled out, the other teeth spread slightly in the jaw when you chew. Small particles of food will lodge around the necks of the remaining teeth. If they are not thoroughly removed, decay may set in and other teeth may have to be repaired or pulled out. This makes the remaining teeth do extra work. This makes the gums sore, and is one cause of pyorrhea. Remember this: when one tooth is extracted, at least five other teeth are affected.

(Slide 11.)

This first picture shows a good healthy mouth in which all the teeth are in their proper places. A person with a mouth like this can chew his food properly.

This second picture shows a mouth from which one tooth has been extracted. Notice how the loss of one tooth has caused the other teeth to shift out of place and allowed decay and pyorrhea to set in.

There are four things to be remembered about the care of teeth:

(Slide 12.)

1. Build the right kind of armor for your teeth by eating the right kind of food: a quart of milk a day, cooked and raw vegetables, stewed and fresh fruits, whole grain cereals and breads. You also need some meat, fish and eggs. Do not make your meals entirely of bread, meat, potatoes and sweet dessert. You cannot build strong bodies or strong teeth on those foods alone. You should have milk, vegetables and fruit and whole grain cereals.

2. Exercise your teeth. Chew some hard, coarse food at each meal. Do not be satisfied with eating only soft mushy food. Eat some coarse food each meal. Dry toast, hard crusts, crackers, raw vegetables, and tough meat help give your teeth exercise.

3. Brush your teeth regularly at least twice a day, every morning and every night. If you can brush them after the noon meal, do so, but brush them at least morning and night. Some people brush their teeth when they first get up. That is a very good habit and if you have acquired that habit, continue it. It is much better to brush your teeth after breakfast, so that you can remove all the food particles that remain from your morning meal. Then you can go to school with clean shining teeth and a flashing smile. Always brush your teeth before going to bed so that the germs cannot cause decay while you are asleep.

4. Visit your dentist three times a year. Some children have such good teeth that they only have to visit the dentist twice a year. It is a good plan for the average boy and girl to visit the dentist three times a year. This enables the dentist to discover and repair any decay before it has eaten through the enamel armor.

Remember, your teeth belong to you. They are members of your body. Take care of them. Keep them. Do not surrender them to the enemy—decay germs.

# DENTAL ECONOMICS

## THE PLACE OF THE A.D.A. IN DENTISTRY*

By C. WILLARD CAMALIER, D.D.S., F.A.C.D., Washington, D. C.

MY subject this morning is the leadership of the A.D.A. with relation to the present and future status of dentistry, and I chose it to call your attention to or refresh your memories of many of the great activities of this great national group and what it is believed it may undertake in future years. In our zeal and affection for our local societies, it is sometimes natural for us to wonder what the A.D.A. is doing in behalf of dentistry and why we should support a national organization. This is a sensible question for those who do not study the situation or do not have it brought to them, but when I remind you of the great number of activities of the parent association and what it may achieve in the future, I hope to be able to enlighten you somewhat and at the same time create an inspiration for renewed interest in this great leader of American dentistry. Our younger men particularly should be informed that they may carry on this splendid work when others have passed on.

The A.D.A. was organized at Niagara Falls, N. Y., Aug. 3, 1859. Permanent organization was effected in Washington, D. C., July 31, 1860, and since then, with the exception of the year 1861, during the Civil War, sessions have been held annually. In 1897, at Old Point Comfort, Va., the Association united with the Southern Dental Association, and the name was changed to the National Dental Association. This name was retained until 1922, when, at Los Angeles, the earlier name was resumed.

In 1859, the membership was naturally very limited, but it has steadily advanced, with the natural upward and downward trends, to approximately 35,000 at the present time. In spite of the depression and the fact that practically all other organizations have lost membership, forty-five constituent societies have exceeded their 1933 membership, and several states have passed their highest former membership mark. The increase in membership over a year ago is in the neighborhood of 5,000. The President, Dr. Casto, has called on the profession to raise the membership of the Association to 45,000 by the time of the New Orleans meeting, and if the interest and renewed inspiration and hope manifested throughout the country can be taken as a criterion, it is believed that his request will be more than complied with. The membership plan of the A.D.A. is also working toward this end, which will undoubtedly contribute to the success of the campaign. On the basis of my latest information from the central office, the membership of the New Jersey State Dental Association is 1,466, and on a basis of 70 per cent of the census of registered dentists in the state, only

*Read at the annual meeting of the New Jersey State Dental Society, Atlantic City, N. J., April 25, 1935.

thirty-three new members need be added to your 1934 membership to secure the quota desired by our President. As your Trustee, I am looking forward confidently to New Jersey's going over the top in the matter of membership.

Another example of leadership by the profession was the assembling of two hundred or more dentists from all over the State of Maryland in the State House at Annapolis to protest an amendment to the dental law of Maryland which would have permitted the governor to appoint any ethical dentist in the state to the Board of Dental Examiners, irrespective of whether he had been nominated by the Maryland State Dental Association. Through the activity of officials of the Maryland State Dental Association, these men, accompanied by Dr. Casto, Charles Cole, member of the Legislative Committee of the American Dental Association, and me as Trustee of the Fourth District, crowded the halls of the Capitol, with the result that, in a comparatively short time, without the necessity of public argument, the amendment was withdrawn. This was a concrete example of organized dentistry in effective action.

New Jersey has the largest membership in the Fourth District and consequently the largest representation in the House of Delegates of the A.D.A. The influence, therefore, of this state in the District is tremendous, and for this reason we lean upon you very greatly for advice and leadership. The officers of this society, representatives in the House of Delegates and on Committees of the A.D.A., have in the past exerted and are now wielding great influence in the association at large. I might mention in passing our good friend, Fred Lum, Vice-President of the A.D.A., and former Trustee of this District, E. J. H. Schneider, president of your society and member of the Economics Committee, Kenneth Pruden, secretary of the Legislative Committee, and John S. Owens, Relief Commissioner. All of these men are active in national affairs, and are a distinct credit to New Jersey and the A.D.A. I could name many other men in New Jersey who are known nationally for their work, but find it necessary to confine my remarks to those on national committees at the present time.

In increased membership, there is power not only for your own state, but also for the A.D.A. It not only means the success and protection of your interests and those of the public at large, but it also gives to the great parent body —the A.D.A.—the resources and energy to carry forward the banner of dentistry. So may I appeal to you, although I do not believe it necessary because of my confidence in your organization, to stand wholeheartedly behind our great national group in both membership and fidelity.

Critics have attempted to belittle the influence of the A.D.A. from the standpoint of its membership. In my opinion, their efforts have been accepted only by persons who think superficially and have no weight with the true student of the numerical strength of dentistry in this country. I am afraid that such persons may have had the intention of lessening the influence of our great group in national and state affairs, and certainly such criticism, while it may not have accomplished its purpose, has tended to encourage some of those on the outside to oppose the principles of ethical dentistry. According to the latest figures that I have been able to obtain, there are about 65,000 registered dentists in the United States, but very many of this number are registered in more than one state. Therefore, it would seem safe to deduct 5,000 of these overlapping members, or retired or incapacitated members, reducing the number to 60,000. There are, according

to information received from the National Association of Dental Examiners, approximately 4,000 semi-advertisers and flagrant advertisers in the United States. Deduct other ineligibles to membership, and the figure drops below 55,000 eligible practicing dentists. If we assume a membership of 35,000, there is a difference of less than 20,000 dentists who are not members of the A.D.A., but I am sure you will agree with me that a large proportion of these dentists, and probably all of them, while not actual members, are sympathetically inclined toward the ideals of the A.D.A. Therefore, when the statement is made that only 50 per cent of the dentists in the United States belong to the A.D.A., it is untrue, from the standpoint of actual figures. In reality, the figure is nearer 64 per cent, but even if it were literally true, the persons who are not directly connected with the Association, but who have instilled in them the ideals thereof, exert a preponderance of influence on the side of organized dentistry. If the goal of 45,000 is reached, the percentage will be more than 80. If my figures are doubted, and there may be those of you who may differ with me, it is easy for you to ascertain from your own city and town how the members of the A.D.A. compare with those who are not connected with the organization. So I say to you that, in spite of all the statements to the contrary, the A.D.A. represents dentistry in the U. S. and its possessions, and its voice should be heard whenever it is necessary for the profession to speak. There are a few other associations of dentists that have been formed for various reasons with which the American Dental Association has no quarrel, and when they have the same ideals and standards as prescribed by the Code of Ethics of the Association, all members thereof should be members of the American Dental Association. For the interest of dentistry as a whole, it is well to have one spokesman in matters of policy and procedure when great decisions are to be made for the profession. It is my understanding that much of the plight of dentists and physicians in Europe is due to the fact that the professions were divided in opinion and organization, and therefore were used by politicians and others to the detriment of the professions and the individual professional man. If dentistry had been a unit in these countries, there would have been a strong national group to speak for it and the members of the profession would not have been talked down by the commercially minded.

We will now consider some of the regular activities of the association. One of them is the publication of THE JOURNAL, the official organ of the American Dental Association. THE JOURNAL, as a whole, is well prepared, properly proportioned in the treatment of subjects and arranged in a dignified and satisfactory manner. While it is impossible to obtain universal approbation of any journal, ours is one that every dentist may be proud to show to his professional brothers. I am sure that THE JOURNAL Committee of the Board of Trustees and the official family of THE JOURNAL itself would be more than pleased to receive suggestions for its improvement; but irrespective of how individuals feel, THE JOURNAL should have the wholehearted support of every ethical dentist. When I say THE JOURNAL should be supported, I mean not merely to read it and contribute articles to it, but also to give it material aid by supporting its advertisers. By this action, you will give financial support and impetus to the work of the Bureau of Public Relations, which, as you know, is endeavoring to furnish valuable information to dental associations, individual dentists and others, to be used for the

benefit of all. I ask, therefore, your wholehearted support of the so-called Beneficial Circle Plan, the details of which may be obtained from the Central Office at Chicago.

The Bureau of Public Relations, under the supervision of Lon W. Morrey, has become one of the outstanding agencies for the advancement of the profession in the A.D.A. With its appropriation of approximately $13,000 a year, it administers the dental educational publicity plan adopted by the Association several years ago, and in addition develops and issues a tremendous amount of material to constituent and component societies throughout the U. S. One of the finest productions of the Bureau is the booklet entitled, "Care of the Teeth." The newspaper articles, the news releases and other data authorized under the dental educational publicity program are proving invaluable to dental societies and other agencies interested in public health. The cooperation of the U. S. Public Health Service in endorsing much of this material has been of great benefit to the Bureau in raising the value of the material in the estimation of recipients.

The Council on Dental Therapeutics has received criticism from various sources in the past, but I believe largely because its work has been misunderstood. The dental profession should stand steadfastly behind a group of scientific men, serving without compensation except in the case of the Secretary, for the purpose only of elevating the standards of dental medicines and remedies used in connection with the practice of dentistry. I especially invite your attention to the Council's recently published booklet entitled, "Accepted Dental Remedies," which is available from the Council at the price of one dollar. This is a valuable adiunct to any office and will undoubtedly be added to from time to time as the work of the Council progresses.

The Committee on Legislation of the Association has always been, and is now, intensely active in its efforts to safeguard the interests of dentistry. It has taken a special interest in the new Food and Drug Act sponsored by Sen. Royal S. Copeland, of New York. At the present writing, it is believed that the interests of the profession have been protected in this measure. The Committee is developing much information concerning the provisions in the various dental laws so that comparison thereof may be made tending to strengthen the laws of each state. Also, I believe it is the intention of this committee to accumulate as much information along the line of court decisions, opinions of attorneys general and others, which may be used in the future by various societies and examining boards. One of the latest examples of leadership of the A.D.A. through this committee was shown when its representatives assisted the attorneys for the Oregon State Board of Dental Examiners in strengthening their arguments to be used by the Supreme Court in connection with that most valuable decision. As stated before, Kenneth Pruden of this state is the secretary of this committee, and he is performing a most valuable service for you and the profession at large.

The Committee on Economics is a newly formed committee composed of one member nominated by each member of the Board of Trustees from his respective district, and the United States Public Health Service, and elected to the committee by the Board. There are, therefore, fourteen men on this committee, which has for its purpose, among other things, the securing of information throughout the United States and foreign countries in matters relating to social or insurance dentistry and plans in operation or contemplated, and working with

the Federal Government and States, through dental societies, in an effort to keep dentistry in line with the new social order of the day or to oppose movements inimical to the interests of the profession.

Your president, Dr. Schneider, is the representative of the Fourth District on this committee and he is also doing very fine work for the Association in this most difficult field. These two committees, the Committee on Legislation and the Committee on Economics, have much in common and their combined efforts are productive of much good for the association.

Another committee which will prove invaluable to the profession, especially for future years, is the Committee on Dental Health Survey, which, it is understood, is nearly ready to make its report, to be in the hands of the printer within the next six weeks. The information secured by this survey, with its million and a half returned examination blanks, contains health data from practically every state in the Union.

The Board of Trustees' Committee on Educational Publicity is active in behalf of the profession and, together with the National Association of Broadcasters and Federal Communications' Commission, is endeavoring to reduce to a minimum fraudulent and misleading advertisements via the radio.

The Committee on Dental Museum is active in collecting data with reference to pathologic cases, which will, in time, be available for study by dental organizations and individuals.

The Judicial Council of the Association has always functioned in an excellent manner and is the particular agency of the Association having to do with the Code of Ethics, amendments thereto, and its enforcement. Too much cannot be said for the efficient operation of this committee.

The Committee on Dental Education is, as its name indicates, especially interested in matters of dental education and is fruitful in its contribution to this field. Its contacts with the American Association of Dental Schools and the Dental Educational Council of America are assisting materially the advancement of dental education.

The Committee on Dental Health Education, the advisory committee to the Bureau of Public Relations, is the agency which passes on all educational material issued under the dental educational publicity plan before it is submitted to the U. S. Public Health Service for approval. This committee has been kept extremely active during the year and has performed excellent service in reviewing and approving the great mass of educational material forwarded to it by the Bureau of Public Relations.

The Dental Relief Fund is, as you know, indispensable to those dentists who find themselves in dire need. Such a worthy cause is deserving of the utmost expression of appreciation.

The Ad Interim Committee of the Board of Trustees, the committee functioning between meetings of the Board of Trustees, is an integral part of the machinery of the A.D.A. in caring for those problems which arise suddenly, and must be handled expeditiously. The members of this committee give much of their time to your interests and those of the A.D.A.

The Transportation Committee, which functions principally during the national meetings, is very necessary to the convenience and ease of travel of individual members.

The various scientific sections, namely, on Operative Dentistry, Materia Medica and Therapeutics; Full Denture Prosthesis; Partial Denture Prosthesis; Oral Surgery, Exodontia and Anesthesia;

Orthodontia; Periodontia; Mouth Hygiene and Preventive Dentistry, and Histology, Physiology, Pathology, Bacteriology and Chemistry (Research) are valuable adjuncts to the success of the meeting of the A.D.A., the activities of the various section officers being numerous and unselfish.

The committees on the U. S. Pharmacopeia and Formulary and the Dental Index, the Relief Commissioners, Dental Relief Fund, representatives on the National Board of Dental Examiners, representatives on the Educational Council of America, members of the Nomenclature Committee, Gorgas Memorial, History Committee and the Fédération Dentaire Internationale are all working actively in the interests of the Association and the individual dentist.

A great deal of work is accomplished by the Committee on Commercial Exhibits, Committee on Clinics and Local Arrangements Committee of each city in which the meeting is held. In spite of the fact that I happen to be one of its members, I desire to pay tribute to the Board of Trustees, and its various committees, in its efforts to administer the affairs of the Association and make decisions pertaining to the well-being of our profession. The responsibility is tremendous, but each member thereof, I am firmly convinced, has only one thought in mind; namely, the advancement of the dental profession. These men are gathered from all sections of the United States, and they have come very often from entirely different types of communities, but basically they have but one object in view.

The administrative officers of your Association, the Secretary, the Editor of THE JOURNAL, the Business Manager, the Treasurer and others, are all laboring in your interest and for the ultimate ideal in dentistry.

The National Board of Dental Examiners has been financially sustained by the American Dental Association, but at present is self-sustaining, and has representatives thereon from the Association, the American Association of Dental Schools, the National Association of Dental Examiners, the Army, the Navy and the United States Public Health Service, who are giving of their time and energy to create a national board analogous to that in medicine. At the present time, only parts one and two (theory) are given, but it is contemplated at some future time to install machinery for the giving of the practical examination, or part three. The board has consummated agreements with only four states who will accept the Board's Certificate in theory, but it is feeling its way and, at some future date, undoubtedly will be a valuable instrument for the advancement of the dental profession. Care should be exercised, of course, that sufficient power be left in the local boards to protect their communities from undesirables.

The Association has instituted the Junior Membership Plan, which I am happy to say is interesting dental students in the work of the Association. You are urged to assist the Central Office in making this particular activity even more of a success than it has been up to the present time.

It hardly seems necessary to call your attention to the annual meeting of the Association except to repeat that it is held each year as a result of much time, effort and expense on the part of individual members and the Association, for the purpose of bringing to every dentist in the Association the new developments in his profession; and at the same time, legislate through the official House of Delegates on matters pertaining vitally to dentistry as a whole.

Special mention should also be made

of the arduous duties performed by members of reference committees of the House of Delegates, the committees appointed to care for the efficient workings of this distinguished group and the very excellent cooperation of the affiliated groups, who add so tremendously to the success of the national meetings. It is needless to mention the individual essayist, clinician, study club and state and local society, except to say that a national meeting would not be possible without their participation. Again, our government services, the Army, the Navy, the Public Health Service and Veterans Bureau, are always an integral part of every convention, and could not be dispensed with without great loss. All this, I say, is due to the leadership and organization of the A.D.A. Do we not, therefore, owe the parent a debt of gratitude sufficient to feed her life stream at least with increased membership and individual fidelity? I am sure you agree that we do and that the entire Fourth District and others who may be in attendance will work with renewed energy in the interests of the Association.

Certain persons may not always agree with the decisions rendered by the national body on matters of policy and procedure, and of course it is always the American right to take a contrary position, but I heartily recommend that very careful and conscientious study be given to decisions by the Board of Trustees and House of Delegates before different action is taken by local groups. The House of Delegates and Board of Trustees are composed of representative men from all over the United States, who endeavor to make their decisions in a calm and deliberative manner with no thought in mind except our interests, and usually their decisions are correct. They do not shout their ideas from the house tops, nor do they seek newspaper or magazine publicity. As a matter of fact, they prefer to stand in the background; but when such men have considered these matters carefully and have come to a unanimous decision, it is dangerous to proceed along other paths without careful consideration of all of the factors involved. It might be well also to say in passing that the members of the Board do not desire to answer their critics in the type of language you have recently heard, because it smacks of cheap publicity and would do the profession of dentistry no good. In the recent criticisms of the Board of Trustees and the House of Delegates on the question of compulsory health insurance, it is amusing to see how a few vociferous persons place their judgment against that of the entire House of Delegates of the A.M.A., and the Board of Trustees of the A.D.A. Anyone who would, for example, read the latest book of Gustav Hartz entitled "Will America Copy Germany's Mistakes?" and "My Experience Under Health Insurance," by Leo Remes, published in the April issue of *Oral Hygiene,* I am sure would be convinced of the futility of saddling American dentistry or American medicine with a system so pernicious and enslaving. These same critics who desire compulsory health insurance, to protect themselves, cite certain principles which must be embodied in this type of legislation, but with probably the only bill of its kind in my possession which has been introduced in any legislature, namely, the Epstein Bill, I fail to see how it would be possible to include these provisions in such legislation. The entire bill would have to be rewritten, practically all of the ideas of sociologists and politicians being scrapped, and a bill written by the profession substituted; which it is obviously impossible to even conjecture. I say that this Epstein bill violates all of these principles, and to jeopardize the in-

terests of this profession to place a provision therein which would give dentistry a place in this administrative and political set-up is contrary to my ideas as to the best method of protecting the interests of the profession. It is infinitely better to take our stand on our convictions, as was done recently by our Board of Trustees, and then if this socially minded age crowds this type of legislation upon the profession, it would naturally have to submit, but only under protest. To say that our protest places dentistry in the position of not having its place at the conference table is ridiculous, for the simple reason that we are necessary to this whole scheme of things and could not possibly be ignored. To take a weak-kneed position, as some of our critics advise, would show a decided lack of leadership, and give politicians, insurance schemers and social workers the encouragement desired to consummate their pet projects. As it is, if members of the A.D.A. and the A.M.A. stand shoulder to shoulder, and notify these despoilers of the health professions in the United States that we oppose the foreign schemes which have proved so disastrous and those which have here come to light, we will have vastly greater opportunities for protecting our interests than if we adopt the weaker attitude.

For instance, it seems unlikely that any legislation of this character could get very far unless the initiating step were taken by Congress, and if such a move were contemplated or a bill introduced, prompt action would be taken by the A.D.A. to see that dentistry's position was made plain. The point is, as I see it, that the Board of Trustees and the A.M.A. are saying to Congress and state legislatures that they do not approve of the principle of compulsory health insurance. It is well for legislators to know this in advance and, with such knowledge before them, it is hoped that no move in this direction will be made. It is a utopian dream, not at all feasible, and could only come to pass as the professions might desire it when some era arrives similar to the millennium.

The A.D.A. and the American College of Dentists spent almost $50,000 on the study of the Costs of Medical Care, and while I believe that many valuable data were accumulated in this study, and the study was fully justified owing to its importance, I do not believe that we should accept health insurance simply because of the expenditures. Do you? This significant fact has been quite evident since the completion of the report of the Committee on the Costs of Medical Care; namely, that in speech and in the press much of the tenor of the discussions in relation thereto has been that health insurance is inevitable. It sometimes takes months and years to crystallize sentiment for an objective and I believe I am not far from wrong when I state that some of the proponents of dental health insurance have been endeavoring to educate the profession to the thought that such would be the end whether it was desired or not. Under the circumstances, is it not logical to ask who is endeavoring to create the demand? Is it the public? I say no, as far as I can see. Is it the profession? I say no, as evidenced by the official acts of their representatives. Is it the great foundations, individual dentists or groups of dentists, welfare workers or insurance companies? Ponder these questions carefully, and I am sure you can answer them satisfactorily.

Some have been so unkind as to suggest personal gain by a few perhaps in the securing of jobs if this insurance business becomes a reality. I cannot say as to that, but the direct action of the Board of Trustees of the A.D.A. and the similar action of the A.M.A. recently taken on

this subject undoubtedly confounded certain of these psychologists and brought their ideas into the limelight. They stand exposed before you and their views have been spread throughout the length and breadth of this land via the great press associations and the *Literary Digest.* It is not that we would discourage criticism. As a matter of fact, constructive criticism is good, but it would have had more weight with professional men if it had been handled less conspicuously.

We have been discussing somewhat the leadership of the A.D.A. in dental affairs of the present. What about the future? It is, of course, difficult to prophesy, and it would be presumptuous of me to attempt to dictate the future policies of the Association, but because of the study given some of these problems and the experience gained from Association work, I feel that I have a right to conjecture regarding the leadership the Association may take on some of dentistry's problems. I list them, as follows, the order of presentation having no bearing on their importance.

1. The membership of the Association should be tremendously increased. The Association, gaining in power and prestige, and being representative of the profession at large, will continue to speak for it in no uncertain terms.

2. The Association will support its Bureau of Public Relations to the end that the whole country will be bountifully supplied with proper educational material, looking to the interests of the public and the profession. In this connection, the programs of state and local societies will be stimulated, and the education of the children of the Nation, with respect to mouth conditions, will be stressed, in the interest of improved health for present and future generations.

3. The Association will intensify efforts to secure a dental representative on all boards of health and the staffs of all hospitals.

4. Efforts will be made to have legislatures grant appropriations for dental educational purposes, for the care of the indigent and the correction of dental defects in children whose parents cannot afford dental work; the latter to be determined by careful investigation of individual cases.

5. The Association will study, and is now studying, plans for the care of the indigent and the low income groups. The care of the indigent is a problem to be handled by the government in conjunction with the profession. The low income group could be cared for by a deferred payment plan, as is now in operation in the District of Columbia and other places, or a savings plan. If anything compulsory is contemplated, it would seem more logical, and less expensive in every way, to require that certain savings be earmarked for health purposes.

Let it be thoroughly understood that the Association is giving careful consideration to this vital problem for its ultimate solution. It has no intention of being stampeded by those who do not have the responsibility upon their shoulders, but who seem to get great satisfaction in broadcasting their "plans" to the public; which even they should know has the effect of possibly creating sentiment tending toward precipitation of the profession into something which may prove disastrous to it, as well as subversive of the public good.

6. In view of the recent Supreme Court decision in the Oregon case, the influence of the Association, through its local groups, or of the Legislative Committee, when requested, will be exerted toward eliminating false and misleading dental advertisements in the press and over the radio.

7. The Association, through its Legis-

lative Committee, will promote or assist other good legislation in Congress in the interest of dental health, and oppose detrimental legislation. One of the measures in Congress bearing its approval, and to have its future help, I am sure, is the Copeland Food and Drug Act.

8. The Association will support state boards and local societies, when requested, in their effort to strengthen their dental statutes.

9. The Association will undoubtedly lend increased aid to the question of research, in order that the problems of dental diseases and their cure may be solved. The research into dental materials will continue and become a greater factor in dental practice than ever before.

10. The publication of a research journal will be undertaken or some other plan instituted whereby all articles on research of a worthwhile nature may be available to the entire profession.

11. The publication of a dental *Hygeia* is not beyond the range of possibilities.

12. The study and exposé of questionable remedies through the Council on Dental Therapeutics will continue and be advanced as conditions warrant.

13. The Committee on Dental Museum will be stimulated to the end that a fine collection of pathologic specimens may be assembled to be made available for study by the profession and others interested.

14. An annual nation-wide radio hook-up on dental health under the sponsorship of the Commission on Radio in Education has been agreed to by the Commission and is awaiting only the action of the A.D.A. to put it into actual operation. The plan contemplates a weekly broadcast of thirty-two weeks, for fifteen or thirty minute periods.

15. Encouragement will be lent in the field of dental education that dental institutions of learning may improve their standards and methods of teaching.

16. The standardization of state laws and dental training will be promoted that the true professional spirit may be exalted and the charlatan and his field of operation be eliminated from the United States and its possessions.

I have endeavored to represent the Fourth District on the Board for the past three years, and during that time have had the cooperation of the entire District. It is always my desire to represent the wishes of my constituency, and if you will let me know your desires, I shall be glad to carry them out to the best of my ability, although differences of opinion sometimes render this difficult. It should be interesting to you to know that the Fourth District is quite well represented in national affairs, having twelve important committee appointments, four of them in New Jersey and the others equitably distributed.

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## MARYLAND STATE DENTAL ASSOCIATION DEFEATS ADVERSE DENTAL LEGISLATION

March 11, 1935, a bill was introduced into the Maryland State Senate which, if enacted into law, would have deprived the Maryland State Dental Association of a voice in selecting the personnel of their state board of examiners.

The officers of the state society on ascertaining the nature of the bill, requested a hearing before the Judiciary Committee to which it had been referred. This hearing was granted and set for the twentieth day of the month, at which time, owing to the activities of organized dentistry, the bill was withdrawn by its sponsors.

D. C. Blevins, president of the Maryland State Dental Association, in reporting this case, says:

"By telephone and telegraph the officers of the five component societies were apprised of the situation and urged to arouse their members to action. Within a few days, there was a flood of telegrams and petitions pouring into our state capitol from political leaders and members of the profession throughout the State protesting against the measure. Mass meetings were being held and appeals made for a large delegation at the hearing. A comprehensive letter had been sent out to every ethical dentist in the state, and many of them attended these unofficial meetings offering their support.

"It augurs well for ethical dentistry in Maryland that we had a delegation of approximately 300 men crowded into the senate chamber at the hour of the hearing. With us were Dr. Casto, A.D.A. President; Dr. Camalier, our Trustee, who had been working with us, and Dr. Cole, member of the Committee on Legislation. We are deeply indebted to these officers of the American Dental Association for their active support and many valuable suggestions.

"Our plan of procedure was to have the president of each component society present an assigned phase of the discussion which we planned to present and express the sentiment of the profession in his section of the state, supported by petitions signed by members of his society. The above-named officers of the American Dental Association would then give the question the significance of a national issue.

"The plan was never carried out, since the opening remark of the chairman of the Judiciary Committee very agreeably informed us that the bill had just been withdrawn by request of its sponsors, and that our victory was won.

"This report is submitted with the thought that, except for vigilance and aggressiveness on the part of the state societies, such destructive measures may become part of our dental laws.

"In Maryland, 'they shall not pass.'"

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## RESOLUTION UNANIMOUSLY ADOPTED BY THE KANSAS STATE DENTAL ASSOCIATION AT ITS ANNUAL MEETING, APRIL 23, 1935

WHEREAS, the Kansas State Dental Association does unqualifiedly believe in the ethical practice of the healing art, and

WHEREAS, it firmly believes that all practitioners and professions of the healing art should stand ready and willing at all times to restrict practice that is unethical and to raise standards of public health, and

WHEREAS, it firmly believes that all practitioners and professions of the healing art should be educationally well founded in the fields they pursue, and that they should be willing to insure that fact to the public, and

WHEREAS, it firmly believes that the Kansas State Dental Association and the Kansas Medical Society have long stood for those qualities in the face of unjust and oppressive opposition from other practitioners and professions of the healing art, be it therefore

*Resolved,* that the members of the Kansas State Dental Association do hereby place themselves on record as commending and approving the ideals and official actions of the Kansas Medical Society toward this result; and that until such time as the members of other professions of the healing art demonstrate and manifest a willingness and intention to cooperate in the betterment and protection of public health shall the members of the Kansas State Dental Association consider it unethical and undesirable for public good, to cooperate professionally with those practitioners.

## RESOLUTION UNANIMOUSLY ADOPTED BY THE KANSAS MEDICAL SOCIETY AT ITS ANNUAL MEETING, MAY 10, 1935

WHEREAS, the Kansas Medical Society has maintained a high standard in the ethical practice of the healing art, and

WHEREAS, the Kansas Medical Society has found similar ethical standards in the function of the Kansas State Dental Association, and

WHEREAS, the Kansas Medical Society believes the Kansas State Dental Association to require such standards of their members as to find them well qualified in such practice of the healing art as their profession demands, and

WHEREAS, the Kansas Medical Society does realize that those dentists who are not members of some society representing the ideals of the Kansas State Dental Association or members of that Association are not signifying their intentions to practice dentistry in the most qualified manner, be it therefore

*Resolved,* that we, the members of the Kansas Medical Society do hereby consider it most unwise and unbecoming of any member of this society to cooperate with any member of the dental profession who is not identified with the most ethical and well founded dental organization of comparative ideals as the Kansas Medical Society.

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## RESOLUTION ADOPTED BY THE GEORGIA DENTAL ASSOCIATION REGARDING HEALTH INSURANCE

*To the Legislative Committee and to the General Membership of the Georgia Dental Association, assembled in Convention in Atlanta, May 13-15, 1935:*

We, the Economic Committee, appointed by our worthy president, Dr. Hunter, to study the problem of a social security program as it applies to dentistry and the dental needs of the people of our state, and in accordance with the general plan of the American Dental Association, beg to submit the following report:

1. We are opposed to a health insurance program for dentistry in America as it has been operated in Europe, because it does not there provide the dental care necessary to the maintenance of the health of the mouth, and reports are that dental conditions in the mouths of these nations are worse than those in America, where we have no compulsory health insurance.

2. We concur with the Board of Trustees of the American Dental Association as expressed in the report of their meeting of Feb. 18, 1935, in the fear that a program of compulsory health insurance administered by the government will almost inevitably lead to a lay control of dental practice, which in Europe has mitigated against a full and satisfactory dental service needed by the general public and has to a large degree become a barrier to the further scientific progress of dentistry.

3. However, we believe there is a definite demand for dental services to be made available to the under-privileged classes, and we feel that this demand must and should be met. We further believe that the government has already decided the question that health insurance is its solution of the problem. We urge, therefore, that the dental profession assume a cooperative attitude toward the government to the end that we may have a part in formulating the program and plan of procedure to be followed, thus avoiding the mistakes and failures of the European plan and that the dental needs of our public in the future may be cared for in harmony with the present high standards of American dentistry, and that the profession itself may be safeguarded in its further efforts in sci-

entific development and progress in the alleviation of dental ills and the promotion of general health among the public at large.

W. A. GARRETT,
I. M. HAIR,
WITHERSPOON WALLACE,
J. D. OSBORNE,
J. R. MITCHELL, *Chairman.*

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## RESOLUTION ADOPTED BY THE ILLINOIS STATE DENTAL SOCIETY REGARDING HEALTH INSURANCE

WHEREAS, the American Dental Association is the organized society of dentists and should enunciate all general expressions of policy because only that organization is qualified to obtain and express the collective opinion of the individual practitioners in organized dentistry, and

WHEREAS, the American Dental Association has expressed the official opinion of its members by placing itself on record as opposing compulsory health insurance in the following terms:

"The Board of Trustees of the American Dental Association believes that the enactment of a program of compulsory health insurance administered by the Federal Government, governments of the individual states or an individual industry, community or similar body would inevitably lead to the regimentation and lay control of dental practice, which would not be in the interests of the public. That a lowering of the standards of dental practice would result is indicated by the evidence from compulsory health insurance legislation in the European countries where it has been in operation for some years and where it has not only failed to accomplish the measures of alleviation expected of it, but also has seriously impeded practitioners of the healing art in the performance of their duties and has been a barrier to the further scientific development of the profession.

"The Board of Trustees commends the House of Delegates of the American Medical Association and approves the action pertaining to compulsory health insurance taken at its meeting, February 16, 1935"; and

WHEREAS, it is the full and proper privilege of any member to differ with this official opinion of the American Dental Association, the usual channels for the expression of such dissenting opinions having been provided, and

WHEREAS, an articulate minority has not seen fit to exercise its right to this forum, but has resorted to the use of the lay press for the discussion of professional problems and for attacking its own duly elected officers; therefore, be it

*Resolved,* that the Illinois State Dental Society deplore these undignified and subversive methods; and be it further

*Resolved,* that the Illinois State Dental Society approve the policy of the American Dental Association as expressed in the foregoing resolution, and commend the Officers and Trustees of the American Dental Association for their intelligent defense of this position; and be it further

*Resolved,* that the Illinois State Dental Society inform the American Dental Association and all components of the Illinois State Dental Society of this action.

Signed for the Public Welfare Committee of
the Illinois State Dental Society.

A. E. CONVERSE,
F. E. EBERT,
A. E. GLAWE,
R. MCLEAN,
W. I. MCNEIL,
LON W. MORREY,
HAROLD HILLENBRAND, *Secretary,*
H. W. OPPICE, *Chairman.*

## ROSENWALD FUND FOR WELFARE WORK

According to the *Chicago Tribune,* May 20, 1935, trustees of the Julius Rosenwald Fund voted $284,000 for welfare work during the fiscal year beginning July 1.

"Trustees of the Julius Rosenwald fund voted yesterday an appropriation of $284,000 to be expended in the fiscal year beginning July 1 for welfare work and rural education among colored persons, and for furthering socialized medicine. Edwin R. Embree, president of the fund, said that the Rosenwald effort to place competent medical service and hospitalization within the reach of persons of moderate means paralleled the program of the medical profession."

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## THE DENTAL CLINIC SOCIETY OF NEW HAVEN, CONNECTICUT

The Dental Clinic Society of New Haven, Conn., provides necessary dental care to persons who are referred to it by component organizations of the New Haven Council of Social Agencies. The articles of association state that "the corporation is not organized for gain and shall never be operated for profit."

No patient capable of paying a private practitioner's fee is treated by the dental clinic society and the dispensary is controlled by local dentists.

Each organization which contributes financially appoints one of its members to the board of directors. The president of the New Haven Dental Association is a director by invitation. An executive committee of five selected from the board of directors has charge of the dispensary. The majority of the committee are dentists in practice in New Haven. Each member of the executive committee has charge of one aspect of the project, such as the supplies, equipment, finance and welfare contacts. Funds are contributed by the New Haven Junior League, the New Haven Foundation, private persons and dentists.

The dispensary, located in a building lent by Yale University, was furnished with old redecorated and repaired dental equipment.

The personnel consists of one executive secretary, and three half-time dentists, the four constituting the paid staff. Chair and clerical assistants consist of members of the Junior League, who volunteer their services. Each day, a supervisor is in charge for consultation and reference. Each supervisor is on duty three days a month and serves without pay. A clinical director is in charge of the entire group. The clinic director is a dentist connected with the school of medicine at Yale University.

Prospective patients must be over 16 years of age and incapable of paying for private service. The welfare agency to which he applies, after satisfying itself as to his eligibility, makes an appointment by 'phone and gives the patient an appointment slip. Furthermore, the welfare agency mails an appointment form to the dispensary. This form is completed on the patient's first visit and returned with the estimate, should the welfare agency assume the financial responsibility.

If the patient requires services other than dentures, roentgenograms or crowns and neither the patient or agency can pay, the work is done gratuitously. The fee schedule is as follows:

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| Registration fee | $0.25 |
| Porcelain crown | 0.50 |
| Fillings: Alloy, synthetic, cement | 0.25 |
| Roentgenograms | 1, 25c; 4, 50c; 10, 1.00 complete, 1.50 |
| Full or partial dentures | 7.50 |
| Prophylaxis | 0.25 |

# CURRENT LITERATURE

*Pituitary Gland and the Blood-Forming Organs:* The pituitary gland, already recognized as "dictator" of most of the other glands in the body and largely the controlling factor in growth and reproduction, may have still another rôle. It may control the way new blood replaces old blood in the body. New experiments just reported indicate that pituitary extract injections produce anemia in animals and two days later new blood cells start to appear to replace the old, depleted ones. The pituitary gland's new rôle is suggested in a letter from Professor E. C. Dodds, director of the Courtauld Institute of Biochemistry in London, and Dr. R. L. Noble, to the editor of *Nature.*—*Science,* May 24, 1935.

*Vitamin C and Rheumatic Fever:* Despite recent animal experiments suggesting that lack of vitamin C in the diet might cause rheumatic fever, the vitamin is neither a cure nor a preventive of the disease and apparently has nothing to do with its cause. First tests of the recent theory on human patients, with the above conclusions, were reported by Drs. Mark P. Schultz, Jules Sendroy and Homer F. Swift, of the Rockefeller Institute for Medical Research, at the meeting at Atlantic City recently of the American Society for Clinical Investigation. Their studies were made on over one hundred persons. Fifteen were patients acutely ill with rheumatic fever. These were given large daily doses of the vitamin in the form of ascorbic [cevitamic] acid by mouth and by injection into the veins and in addition large doses of orange juice. They were also given substances rich in other vitamins. No beneficial effect of this treatment was seen. Two groups of children, about thirty in each, were examined carefully for several months beginning in midwinter. Children in one of the groups were given large daily doses of vitamin C in the form of ascorbic acid. Although the children not receiving the vitamin developed a mild degree of scurvy in early spring, there was no difference between the groups as far as the rheumatic disease was concerned. In fact, relapses of acute rheumatic fever occurred in three children who had received the ascorbic acid daily for two to three months. Careful tests of the use and storage of vitamin C in thirty patients and nonrheumatic persons showed in the rheumatic patients no abnormality in the way the vitamin was handled by the body nor any deficiency in the body's store of this vitamin. The theory that lack of vitamin C and consequent development of scurvy was a factor in causing rheumatic disease was based on experiments reported by Drs. James F. Rinehart and S. R. Mettier, of San Francisco, two years ago. They produced symptoms resembling human rheumatic disease in guinea-pigs deprived of vitamin C until a mild degree of scurvy appeared. The animal experiments were repeated by a Rockefeller Institute scientist with the same results. Studies on human patients now indicate that lack of the vitamin is not important in causing the disease. —*Science,* May 10, 1935.

*Hypophysis and Teeth. I. Changes in Rat Incisor Following Hypophysectomy (Isaac Schour, Angle Orthodontist, 4:3-21 [Jan.] 1934):* The effect of hypophysectomy on the incisor of the white rat has been studied in twenty-three completely hypophysectomized rats (from sixty-three to 459 days after operation) and sixteen litter mate control rats in respect to gross changes (including roentgen-ray findings and eruption rates) and microscopic alterations. The findings were: 1. Progressive retardation and final cessation of eruption. 2. Distortion of form, especially in the basal zone. 3. Reduction in size of teeth (two-thirds normal size). 4. Severe histopathologic changes. 5. Disturbances in calcification.

ISAAC SCHOUR.

*Hypophysis and Teeth. II. Effects of Replacement Therapy on Eruption and Histologic Changes of the Teeth of Hypophysectomized Rat (Isaac Schour, Angle Orthodontist, 4:142-148 [April] 1934):* There were the following findings: 1. Following hypophysectomy, the eruption of the incisor of the rat becomes progressively slower and finally ceases. 2. If not administered too late after operation, growth-promoting hormone increases the eruption rate of the incisor. An increase in body-weight, following the administration of hormone to the hypophysectomized animal, is always associated with an increase in the rate of the eruption of the incisor. 3. In the normal animal, the administration of growth-promoting hormone under the experimental conditions described, although definitely increasing body weight, does not appreciably alter the eruption rate of the incisor. 4. The histologic alterations observed in the incisors of the hypophysectomized rat were not significantly modified by replacement therapy. 5. Replacement therapy tended to confer complete normality to the molar of the hypophysectomized rat in respect to the histologic structures.

ISAAC SCHOUR.

*Passage of Bacteria from Lungs to Blood Stream (W. M. Tuttle and P. R. Cannon, J. Infect. Dis., January-February, 1935):* Tuttle and Cannon introduced bacterial suspensions of *Staphylococcus aureus, Bacillus prodigiosus* and *Streptococcus haemolyticus* into the left lower lobe of the lungs in fourteen healthy dogs and took cultures of samples of blood from the femoral artery and lymph from the thoracic duct at frequent intervals during the first sixty minutes. In the animals injected with staphylococci and prodigiosus bacilli, both the blood and the lymph remained sterile throughout the period of observation. The bacteria were demonstrable in the lungs at the end of the experiment, many already engulfed by septal cells. In the dogs injected with hemolytic streptococci, the micro-organisms quickly entered the blood stream, whereas the thoracic lymph remained sterile in most instances; which proved that the bacterial passage from the lungs into the blood stream was direct, rather than indirect by way of the lymphatic channels. It is probable that the differences in response of the pulmonary tissues to the micro-organisms employed depend to a large extent on the varying degrees of injury to the cellular and tissue barriers within the lungs and that the experimental bacteremia occurred because of increased permeability of these membranes induced by the virulence and toxicogenicity of the bacteria.—*J.A.M.A.*, May 18, 1935.

*Factors in Determination of Radiosensitivity of Cancers of Oral Cavity and Upper Respiratory Tracts (A. P. Stout, Am. J. Roentgenol. & Rad. Therap., April, 1935):* In attempt to estimate the radiosensitivity of oral, nasal and laryngeal neoplasms, 112 treated cases (ninety-one squamous cell epitheliomas, seven sarcomas, two carcinomas and one each of mixed tumor, malignant melanoma and granular cell rhabdomyoma) were reviewed. The investigation showed that infection, invasion of bone and cartilage, deep infiltration and syphilis tend to make this group of tumors statistically more resistant than they are in the absence of these factors. Small size and leukoplakia favored radiosensitivity statistically. Vocal cord, nasal, antral, cheek and gum tumors are highly resistant; whereas, extrinsic laryngeal, nasopharyngeal, tongue, floor of mouth and lower lip tumors include a high percentage of sensitive neoplasms. Those histologic features indicating high resistance were: the presence of mucin secreting cells, nerve sheath invasion, calcification, formation of glands, the presence of melanin and collagen fibers, and in the squamous cell carcinomas, much keratin, many intercellular bridges and epithelial pearls. The author recommends the use of selective stains (Mason's trichrome) for determination of the presence of keratin. Bizarre cell forms and presence or absence of metastases, frequent mitoses and papillary tumors were not significant in determining sensitivity.

GRANT VAN HUYSEN.

*Curability of Malignant Tumors of Upper Jaw and Antrum (G. B. New and C. N. Cabot, Surg. Gynec. & Obst., May,*

*1935):* The type and activity of the malignancy should be determined in all cases by frozen section study at the time of operation. A survey of 295 patients with malignancy, 141 of the antrum and 154 of the upper jaw, is presented. In low grade lesions, the object at operation is to destroy the tumor completely. In more highly malignant tumors, thorough drainage should be established by the destruction of the tumor and radium then inserted if required. The authors recommend diathermy as the operative measure of choice in both types. After this treatment, monthly or six-week interval check-ups are recommended. The operation is preferably made by intraoral approach and the opening closed by use of a vulcanite plate. Of patients with primary malignancy of the antrum, 40 per cent of the traced were alive and without recurrence five years after the operation. Similar five-year results were reported for 53.4 per cent of the traced secondary antral tumors and 62 per cent of the traced upper jaw neoplasms. Of the entire group, 236 cases were traced, and, of these, 52.8 per cent showed five-year cures.

HAMILTON ROBINSON.

*Tumors of the Jaw (C. F. Geschickter, Am. J. Cancer, May, 1935):* The author gives the following classification of tumors of the jaw as used in the Surgical Pathology Laboratory at Johns Hopkins Hospital: 1. Dental and benign osseous tumors (265 cases), which include radicular cysts, follicular or dentigerous cysts, adamantinoma, odontoma, giant cell epulis, osteoma and ossifying fibroma. 2. Malignant osseous tumors (forty-four cases), which include osteogenic sarcoma (sclerosing and chondral), Ewing's tumor and tumors with skeletal and jaw development. 3. Epithelial tumors (fourteen cases), which include epidermal cancer, adenocystic basal-cell carcinoma, metastatic carcinoma and aberrant parotid. Each group is discussed from the standpoint of diagnosis and treatment.

M. K. HINE.

*Osteogenesis (J. D. Bisgard, Arch. Surg., May, 1935):* From a series of experiments performed on a number of dogs in which various subperiosteal resections, rib and periosteal resections, isolation of periosteum and bone and other procedures were carried out to determine the influence of various factors on osteogenesis, the author concludes that costal periosteum is directly or indirectly osteogenic; costal regeneration is limited by periosteum and fails in the absence of periosteum; reparative osteogenesis is influenced by various conditions, i.e., the age, blood supply, foreign body or muscle pressure, cauterization and chemical electric coagulation. The conclusions are drawn from roentgenographic, gross and microscopic studies.

HAMILTON ROBINSON.

*Acute Osteomyelitis of Lower Jaw (C. W. Cutler, Jr., Surg. Clin. N. America, April, 1935):* The author reports a case of uncomplicated osteomyelitis having a typical history starting with pain and swelling of the left side of the mandible, after which a molar tooth was extracted. After this extraction, a fulminating osteomyelitis was started which involved the body of the jaw including both rami nearly up to the condyloid process. The local symptoms were accompanied by rise in temperature, malaise, prostration, anorexia and restriction of motion in the temporomandibular joint. Conservative treatment was instituted with removal of teeth back of the lower incisors, because of misalinement and stabilization of the mandible with a molded splint. Osteomyelitis of the mandible usually occurs by direct extension from an infected tooth rather than through the blood stream. As a rule, it is unilateral and it occurs most frequently in children. The mandible, like the long bones, is more apt to contain extensive areas of destruction; whereas, the rami, like the flat spongy bones, is usually the seat of localized and circumscribed necrosis. Irradiation in the early stages is of little or no avail. The author considers it safer not to curet sockets in the presence of peridental abscess.

GRANT VAN HUYSEN.

*Cancer of the Cheek (Buccal Mucosa) (H. E. Marton and O. H. Pfleuger, Arch. Surg., May, 1935):* In a study of ninety-

nine cases of proved carcinoma of the cheek, chronic irritation was the more obvious etiologic factor and, in 23 per cent of the cases, was definitely from dental irritation, either sharp teeth or ill-fitting dentures. In 23 per cent of these cases, leukoplakia was specifically noted. In the same clinic, through a special investigation, this condition was found in 70 per cent of cancers of the cheek. Biopsy should be made at the time of first examination to confirm the clinical impression. In the early stages of buccal carcinoma, there are no symptoms, "soreness" often being noticed as the first symptom, indicating a fairly advanced stage of the growth. In 30 per cent of the cases, the lesion was from 3 to 4 cm. in diameter at the time of admission. Metastases tend to occur comparatively late in this neoplasm. The authors recommend a combination of irradiation and surgical intervention as the most successful treatment. The oral hygiene must be improved before treatment, the sharp teeth being smoothed or extracted, but wholesale extraction is avoided because of the attendant laceration, increasing oral sepsis. The surfaces of the teeth should be carefully cleaned by a dentist and the patient instructed in toothbrush technic. Compound solution of sodium perborate as a mouth wash and copious irrigations with saline solution are of great value until the irradiation reaction subsides. In these ninety-nine unselected cases, 30 per cent of patients were living and free from recurrence after five years.

HAMILTON ROBINSON.

## FOREIGN LITERATURE

*Contribution to Bactericidal Action of Human Saliva with Special Consideration of Diphtheria Bacillus (K. W. Clauberg, Zentrabl. f. Bakteriol., April, 1935):* Dold and Weigmann's report on the bactericidal action of human saliva on the diphtheria bacillus is discussed. For determining whether this effect is the result of bacterial antagonism, the author uses Seitz filtrates of saliva and finds that the effect persists and also that heating does not remove it. For these reasons, it is concluded that the action is not due to bacterial antagonism, but it is found that concentrations of inorganic salts corresponding to those of saliva are capable of exerting an inhibitory action on the growth of the diphtheria bacillus, the influenza bacillus and pneumococci. From these observations, it is concluded that the antibacterial effects are the results of the influences of osmosis and the action of the salts.

B. G. BIBBY.

*Roentgenography of Salivary Ducts After Injection of Opaque Substance: Sialography (Jacobovica and Jianu, J. de radiol. et d'ectrol., Sept., 1933; abstr. Am. J. Roentgenol. & Rad. Therap., March, 1935):* Neo-iodipin Merck, 20 to 40 per cent, is injected into the opening of the salivary gland. For the submaxillary gland, from 2.5 to 4 c.c. is used; for the excretory canal alone, 1.5 c.c., and for the parotid gland, from 4 to 6 c.c. A postero-anterior and a lateral incidence beam are used for the parotid, the former permitting in addition to visualization of the gland proper, the demonstration of Stenson's duct with its two ramifications, the latter showing the entire tract of the canal. For visualization of the submaxillary gland, the same incidences are used except that, in this case, the lateral beam is projected in the same manner as for roentgen-ray examination of the lower jaw. Obstructions at various levels of the excretory canals are easily detected. It is possible to make a differentiation, especially at an advanced age, between a salivary calculus, which would not show in an ordinary roentgenogram, and an obstruction due to a tumor. It is further possible to show, in the case of a tumor of the parotid gland, the extent of invasion and the amount of destruction of the normal gland.

GRANT VAN HUYSEN.

*Sequelae of Injection of Anesthesia in the Mouth—A Bacteriological Investigation (H. Round, Brit. Med. J., April 27, 1935):* The sequelae of injection anesthesia are pain, swelling, neuralgia, sloughing and osteomyelitis. The causes are (1) faulty technic of sterilization of tissues and instruments, (2) loss of blood supply following epinephrine injection and trauma and

tension enabling organisms in tissues to assume invasive properties and (3) invasion of organisms following operation. The bacteriologic aspects of the question were investigated by taking cultures from the tissues and needle at five stages of the injection procedure. It was found that (1) the mucosa before sterilization always showed *M. pharynges flavus,* frequently *Streptococcus viridans* and *haemolyticus,* pneumococci and staphylococci being rare; and (2) separation of the sterilized area from adjacent tissues was necessary to ensure continued absence of bacteria. Gauze rolls soaked in iodin are recommended for this purpose. B. G. Bibby.

*New Aspects of Deficiencies in Nutrition (D. Hunter, Lancet, May 4, 1935):* The history, distribution, causes, source of preventive substance, pathology and treatment of the various conditions arising from deficiencies in nutrition are discussed. Included in the series are rickets, xeropthalmia, beriberi, pellagra, scurvy, endemic goiter, nutritional anemia, idiopathic hypochromic anemia, pernicious anemia and anemia following gastric operations.

M. K. Hine.

*Silicate Cements (E. Matthews, Proc. Roy. Soc. Med., April, 1935):* The author gives the analysis of two silicate cements and states that the percentage of highly soluble sodium oxide in silicate cements is of major significance in its composition. The manufacture and the theoretical chemical action which takes place during mixing are briefly described. From a review of the literature and original examinations of cements as to their porosity, solubility, bactericidal action, acidity and shrinkage, the following significant points are noted by the author: (1) the need for a reduction in the solubility of the silicate cements by a reduction in the flux content; (2) the necessity for standardizing the powder-liquid ratio; (3) superiority of minimal spatulation, with all powder added at once and a thirty second mix; (4) need for avoiding contraction of the set cement, which can be done by keeping down the water content of the cement liquid; (5) advisability of exposure to saliva after initial set (seven minutes); (6) necessity for keeping old cement fillings moist in working on other parts of the mouth; (7) reduction in the acidity and porosity of the set cement by the use of "durosim." The author also cautions the operator against the drying of cavity walls as dried dentin extracts moisture from the setting filling; which leads to gross contraction and the formation of a chalky layer, affecting the translucency of the filling. Grant Van Huysen.

*Reimplantation of a Tooth Eight Days After an Accident (Eugene Pierre Darcissac, L'Odontologie, April 4, 1935):* Dr. Darcissac holds a clinic over the case of a young lady, aged 21, who had been in an automobile accident. When he first saw her, he discovered that the central incisors were fractured and loosened and the cuspid missing as a result of the accident. The lateral incisors had never erupted. The first bicuspid was also gone. The patient had been wearing a prosthesis to replace the missing bicuspid. The author tells in detail each step of the procedure in which he prepared the appliance to replace the cuspid and fix the loosened central incisors. Extreme care had to be taken in sterilizing the tooth and gums, in which the reimplantation was made. The postoperative care was also important. Advice was given the patient for maintaining the strictest oral hygiene. The patient was seen again at the end of three months. From an esthetic point of view, the reimplantation was a complete success. The cuspid was solidly implanted, but the central incisors were still slightly loose. After some additional treatment, the patient's condition was entirely corrected. T.

*Pyorrhea Alveolaris and Roentgenography (A. Bouland, Sem. Dentaire, May 5, 1935):* Complete roentgen examinations are indispensable before beginning treatment of pyorrhea. This examination aids in establishing an early and correct diagnosis. It shows the extent of evolution of the lesions and has a prognostic value. As a means of control of therapeutic results, it has not much value, although it can give some in-

formation on the processes of healing and repair. The author gives his technic and three case reports. T.

***Soap Considered as a Gingival Poison (Camille André, Rev. Odontol., April, 1935):*** The use of soap dentifrices has dominated dental hygiene in the present generation. The author gives a historical survey of the early literature on this subject. He states that soap has a caustic and irritating action when in contact with the oral mucosa. He compares the tissues of the skin and the mucosa in connection with their relative reactions to soap, pointing out that the mucous membrane has no epidermal barrier to protect it from the action of the soap. The epithelial lining of the mucous membrane has no resistance against soap. The author explains the mechanism of soap's harmful action on the muciparous glands. It is a slow chronic poison concentrating its action on the dental interstices. Daily use of soap dentifrices is responsible for chronic lesions and lowered tissue resistance. The mouth is normally acid, but constant use of soap changes the dental interstices to an alkaline state. Permanent alkalinization produces simple inflammatory lesions and a good medium for bacterial infections. André conducted experiments on the action of soap on dental cement. Cement was injured by twenty-four hours' contact with a soapy solution. Certain deductions are necessarily made concerning the use of soap dentifrices and further experiments on this subject are believed to be necessary.

T.

***Action of Irradiated Ergosterol, Particularly from Viewpoint of Dentition (Dr. Pierron, Paris méd., Aug. 4, 1934):*** The action of irradiated ergosterol on calcium metabolism is a well established fact. By the addition of a diet rich in phosphorus, the author obtains good results in dental calcification. He studied a large number of children between the ages of 3 and 12, who had had dental disturbances. He tells the calcium requirements for children of this age. Among the children with delayed dentition or multiple caries, he used the the above-mentioned combination of irradiated ergosterol and an organic phosphorus preparation. The results of the medication were rapid eruption of the delayed teeth and no appearance of new caries after the previously existing caries had been treated. The general condition of the children was greatly improved. They had an increase in appetite, weight and growth, and more physical and intellectual vivacity.

T.

***Case of Inferior Dental Nerve Perforating Root of First Lower Molar (J. B. Parfitt, Brit. D. J., May 1, 1935):*** A patient aged 25 years had an unerupted first molar as shown by the roentgen-ray examination. Extraction showed the anterior root pierced by a foramen 1.5 mm. in diameter, 3 mm. from the apex. The posterior root was deeply grooved. After its removal, the area supplied by the mental branch of the nerve was anesthetized. T.

***Innervation of Human Dentin (Joseph Munch, Ztschr. Zellf. u. mikr. Anat., 21: 506-603, 1934):*** By means of a modified osmium-tannin method, nerve fibers were traced from the pulp, and between the odontoblasts, into the dentin. Some of these fibers do not follow the course of the dentinal tubules but branch laterally and show a thickening, which suggests that one deals here with sensory cells of the type of the spinal ganglions. The clinical conditions of hyperalgesia of dentin can thus be readily explained. ISAAC SCHOUR.

***Diet and the Teeth: Some Criticism of Mrs. Mellanby's Work (Robert Weaver, Brit. D. J., May 1, 1935):*** Weaver undertakes an analysis of Mellanby's "Diet and the Teeth" chapter by chapter. He finds illogical deductions, insufficient proofs, and unjustified conclusions in each one submitted. He summarizes his objections to her work as follows: "1. Association between two conditions does not warrant any conclusion as to causal relationship, and that being so, it cannot be regarded as established that the original structure of a tooth is of importance in determining its liability to caries. 2. The hypothesis that

there is a close association between structure and caries in the case of permanent teeth appears to be in conflict with Mrs. Mellanby's own results. 3. The findings in the Sheffield and Birmingham experiments are capable of an interpretation other than that given by Mrs. Mellanby. It has not been established that the resistance of a tooth to caries can be raised or lowered after eruption. 4. Mrs. Mellanby's theory does not appear to be in harmony with the information available as to (*a*) the relative liability to caries of the different surfaces of the teeth; (*b*) the incidence of rickets; (*c*) the incidence of caries in New Zealand, Australia and South Africa; (*d*) the asymmetry of caries on opposite sides of the mouth; (*e*) the views held by dentists concerning the relative liability to caries of vital and pulpless teeth. Attention is drawn to some striking differences between the findings reported by Mrs. Mellanby in 1927 and those recorded in the 1934 report." T.

*Coagulation of Blood and Blood Platelets (K. Lenggenhager, Schweiz. Med. Wchnschr., March 23, 1935):* Lenggenhager points out that the rapid coagulation of the blood outside the body is generally ascribed primarily to the blood platelets, which, stimulated by the foreign surface and by the air, produce a substance (thrombokinase or cytozym) which, together with calcium and the blood substances prothrombin or serozym produces thrombin. To determine whether the kinase is derived chiefly from the blood platelets, the author made experiments which demonstrated that, as formers of thrombokinase, the blood platelets have practically no significance and thus are not responsible for the coagulation of blood outside the body. The coagulation is induced by the transformation of a prokinase that circulated in the blood and which, under the influence of evaporation and of the adhesiveness of the surroundings and in the presence of calcium ions, produces the thrombokinase, which in turn, together with the prothrombin of the blood and in the presence of calcium ions, produces thrombin, the coagulation ferment. This explains also why normal coagulation time exists in thrombopenia.—*J.A.M.A.,* May 18, 1935.

*Double Refraction and Finer Structures of Human Dentin (Ztschr. Zellf. u. mikr. Anat., 21:635-652, 1934):* On the basis of polarized light, the direction of the collagenous fibers may deviate considerably from the general arrangement "perpendicular to the dentinal tubules." In tangential ground sections, there is a negative cross around each dentinal tubule. In boiled ground sections, the spheres of globular dentin show negative crosses. The salts are therefore deposited in spherical form. The semilunar areas (named by Cape and Kitchin) show in an untreated ground section as places of lesser double refraction and in boiled (collagen free) ground section as places of greater double refraction. This confirms the findings of Cape and Kitchin that the semilunar areas are inorganic structures. Globular and semilunar dentin are related in that the calcium which is laid down first shows a spherical arrangement that is lost during the further advance of calcification but appears again in arcades at the beginning of a new onset of calcification. Around some dentinal tubules one observes conspicuously large spaces of dentin matrix that are free of tubules and that show negative crosses under polarized light. Here one deals with dentin substance which is associated with giant tubules that have become gradually constricted. Such giant tubules could be observed in ground sections. Isaac Schour.

*Study of Anesthesias (F. Starlinger and H. Kiener, Arch. f. klin. Chir., March 4, 1935):* The object of this study, according to Starlinger and Kiener, was to establish the safety of various methods of anesthesia. The material surveyed consisted of major surgical operations performed from 1929 to 1934 in the First Surgical Clinic of Vienna. There were altogether 7,926 major operations and twenty-two fatalities, which took place in the course of the operation or immediately after. The number of operations performed under ether anesthesia was 3,646; under local anesthesia, 3,244; under

nitrous oxide gas anesthesia 863; under tribrom-ethanol, 131, and under evipan, 42. A careful analysis of the twenty-two fatalities revealed that in only one instance was the death caused primarily by the anesthetic, the method being that of spinal anesthesia. A statistical comparison of the postoperative morbidity and mortality as seen especially in the surgery of the upper part of the abdomen confirmed the fact that nitrogen monoxide gas anesthesia in combination with local anesthesia or with the addition of small amounts of ether is the least harmful. The number of ether anesthetics given in the clinic showed a decline, while that of nitrogen monoxide combination anesthesia showed a rise. Tribrom-ethanol, evipan and spinal anesthesia are assigned an entirely insignificant part as anesthetics.—*J.A.M.A.*, May 18, 1935.

## NEWS

### CALIFORNIA

*Pacific Coast Dental Conference:* An article has been released to several medical and dental bulletins in the state concerning the Pacific Coast Dental Conference July 8-13, 1935. The following speakers are announced: Arthur H. Merritt, New York City, subject: "The Differential Diagnosis of the Common Diseases of the Periodontium"; Bert G. Anderson, Yale Medical School, "The Efforts to Control Dental Caries"; John Oppie McCall, New York City, "Dentistry for Children"; B. H. Broadbent, Cleveland, Ohio; Harvey Stallard, "The Common Derangements of the Masticatory Mechanism"; Howard W. Odum, University of North Carolina, "The Doctor's Social Problems, Past Present and Future"; L. E. Blauch, Chicago, "Dental Education"; Howard R. Raper, "Dentistry and Your Health."

*The Protective Advertising Bill:* Assembly Bill 990, having passed both houses almost unanimously, was submitted to the governor who signed it May 7, according to word received from Sacramento.

### CONNECTICUT

*Dr. Anthony Awarded Newell Sill Jenkins Medal:* Dr. L. Pierce Anthony, editor of *Dental Cosmos*, was awarded the Newell Sill Jenkins Medal by the Connecticut State Dental Association at its annual convention in Waterbury, May 9. After the presentation, Dr. Anthony read a paper on "Pioneer Dentists of Connecticut and Their Influence on the Profession."

### ILLINOIS

*Course in Oral Surgery:* The Cook County Graduate School of Dentistry is in affiliation with the Cook County Graduate School of Medicine and has for its purpose the utilizing of the clinical facilities of the Cook County Hospital for the benefit of the dental profession. Through its courses of instruction, the Graduate School of Dentistry will extend to the dental profession the same opportunities for observation and study of the clinical material of the Cook County Hospital in the field of pathology, medicine, surgery and allied specialties as is extended to the medical profession.

*Dr. Tylman Editor:* Dr. Stanley Tylman, last year president of the Chicago Dental Society, has been appointed editor of the bulletin of the society, succeeding E. J. Ryan, who is now president.

*State Supreme Court Upholds Dentistry Law:* The Illinois Supreme Court has upheld the constitutionality of the 1934 dental practice act, ruling that dentistry is a profession and that the prohibition in the act is not discriminatory. One question involved was whether the law was in restriction of trade in that it forbids the practice of dental surgery under the name of a corporation, company or association. The opinion, prepared by Justice Paul Farthing, of Belleville, was that the legislature was

not dealing with traders in commodities, but with the vital interest of public health, and with a profession treating bodily ills and demanding different standards of conduct from those which are traditional in competition with the market place; and that there is no doubt concerning the authority of the state to ban questionable practices where public health is involved, since the dental law is not discriminatory but applies to all practitioners. Conflicting rulings had been given in two lower court cases consolidated in the appeal.

*Drs. Schour and Brodie Honored:* Isaac Schour and Allen G. Brodie, of the Illinois University College of Dentistry, were awarded certificates of merit at the recent meeting of the American Medical Association in Atlantic City, N. J., for an exhibit coming under the classification of Class 1, exhibits of individual investigations, on the basis of originality and excellence of presentation.

**LOUISIANA**

*Opening Postponed:* The opening of the Louisiana State University Dental School at New Orleans has been postponed for a year. S. H. McAfee, dean, states that it has been decided to wait until the building is entirely completed and fully equipped in every detail before students are accepted.

**MICHIGAN**

*A New District:* April 8, a group consisting of almost every dentist in Alpena, Rogers City and Harrisville met for dinner in Alpena. William R. Davis, of Lansing, who was in the vicinity on school dental health programs, was invited to be present and addressed the dentists on "Some Progress and Problems in Public Health." They planned to form a society and apply for a charter as a component of the Michigan State Dental Society. Temporary officers were elected as follows: president, E. G. Beane, Alpena; vice-president, R. G. Boyce, Rogers City; secretary-treasurer, F. W. Oles, Alpena.

**OHIO**

*Annual Clinic, Cleveland Dental Society:* The Annual Clinic of the Cleveland Dental Society was held May 6-7 at Hotel Statler. A testimonial luncheon was given Frank M. Casto, President of the American Dental Association. The general topic, "Dentistry in Its Relation to the Public Welfare" was presented by sixteen speakers. The following members of the profession appeared on the clinic program: George B. Winter, President-Elect of the American Dental Association, Marshall Weaver, DeForest Davis, Edwin N. Kent, Alfred Walker, and Robert R. Gillis. The total registration was 1,094.

*News from Army Medical Center:* A committee of members of the dental profession of New York has procured from the New York City studio of the artist Mr. Bernard Godwin a portrait in oil of the late Capt. John S. Marshall, D.C., who was the first dental officer of the United States Army. In addition, the officers of the Army Dental Corps are presenting a portrait in oil, by the same artist, of Col. Robert Todd Oliver, U. S. Army, Retired, a former officer of the Dental Corps and its senior member for many years. These portraits were presented to the U. S. Army Dental School, May 30, with appropriate ceremony in the auditorium of the Army Medical Center. Lieut.-Col. John L. Peters presented the portrait of Captain Marshall and Col. Frank P. Stone presented that of Colonel Oliver. Lieut.-Col. R. H. Mills presided and accepted the portraits on behalf of the Army Dental School. Officers and their families, all members of the dental profession, members of the Army Nurse Corps, aids and dietitians were invited to be present.

**TEXAS**

*State Adopts Annual Registration:* Texas has adopted annual registration, the new law requiring annual registration to all licensees to practice dentistry.

**GENERAL**

*Awards for Research on Vitamin A:* The Mead Johnson Vitamin A Research Award Committee announces that the award for laboratory research, $5,000, has been divided between Karl E. Mason, Ph.D., Nashville, Tenn., and Simeon Burt Wolbach, D.D.S., Boston. Dr. Mason was

honored for his work at Vanderbilt University on "Changes in the Vaginal Epithelium of the Rat After Vitamin A Deficiency." Dr. Wolbach, whose research was done in collaboration with Percy R. Howe, D.D.S., at Harvard University, dealt with "The Incisor Teeth of Albino Rats and Guinea-Pigs in Vitamin A Deficiency and Repair."

*Dental Practice Acts: Appointments to Board Limited to Nominees of Dental Association:* The Tennessee state board of dental examiners revoked the license of Prosterman to practice dentistry and he brought suit in the chancery court, Hamilton county, to have the order of revocation set aside. The court, after reviewing the evidence, entered a decree suspending Prosterman's license for thirty days. Both the board and Prosterman appealed to the Supreme Court of Tennessee, the former contending that the chancery court exceeded its authority in modifying the order of the board, the latter protesting that his license should not have been suspended at all. Prosterman, said the Supreme Court, was entitled to a trial de novo and, under the laws of Tennessee, the chancery court had authority to pass on the facts and modify the order of the board. The Supreme Court sustained the finding of the chancery court that Prosterman had falsely advertised that he had twenty years' experience in all lines or branches of dentistry. Prosterman himself admitted that he had had only ten years. The Supreme Court found misleading a representation made by Prosterman to prospective patients that he was a "dentist formerly professor and dean Southern Dental Institute, Atlanta, Georgia." Prosterman sought to justify the representation by testifying that he had at one time organized a concern by this name, in Atlanta, which he operated a short time in connection with his dental office there. But, the court said, the organization was little more than a name. Prosterman himself testified that he employed no instructors in the so-called institute, that he was the only dentist connected with it. "We think," said the Supreme Court, "it is too plain for argument that such a situation did not justify his holding himself out as 'formerly Professor and Dean Southern Dental Institute.' " " 'Professor' of an 'institute,' " said the court, "implies a position of importance and recognition by others of capacity. The term 'dean' clearly suggests an office of responsibility, and definitely denotes a group situation. It is a misleading misnomer if applied to a situation where one person is engaged, acting for himself and directing only his own individual activities." Prosterman further challenged the constitutionality of the dental practice act, specifically complaining that the group from which the governor may appoint members of the board of examiners is limited, by statute, to such dentists as shall be recommended for appointment by the state dental association. "While the practice of dentistry," said the court, "is a property right, we do not understand that this is true of membership on the state dental or other appointive boards." The right of every qualified dentist to practice his calling, provided he does so within the law, is safeguarded by the dental practice act, and the courts are open to all for relief in case the board of examiners appointed by the governor acts arbitrarily or illegally. "We find," concluded the court, "no constitutional difficulty with this act." The decree of the chancery court, suspending Prosterman's license for thirty days, was affirmed.—Prosterman v. Tennessee State Board of Dental Examiners (Tenn.), 73 S. W. (2nd) 687.—*J.A.M.A.*, May 11, 1935.

**FOREIGN**

*Drug Waste Under the Insurance System: Manchester's Addiction to Medicine:* A report of the Ministry of Health shows that in England the national health insurance system involved excessive prescribing and therefore waste of drugs was reviewed. The root of the evil is that the working class likes to take medicine, whether for real or for imaginary ailments, and can obtain it without cost under the insurance system. The *Lancet* has suggested that a small charge should be made for drugs, and this has been done in the Canadian insurance system. Attempts have been made to ex-

plain away this excessive prescribing, but the argument that the cost of drugs per head under the insurance system in England is 50 per cent greater in England than in Scotland, where no such weakness for drugs exists, has proved unanswerable. In some parts of England the evil is much greater than in others. According to the *British Medical Journal,* Manchester "has maintained over a term of years a steady 50 per cent increase over the corresponding national averages." What the Manchester *Guardian* describes as "Manchester's notorious addiction to medicine" has led to a prolonged effort on the part of a special subcommittee appointed by the Manchester Insurance Committee to explain this unenviable preeminence. The subcommittee has attempted to arrive at some explanation by examination of statistics relating to industrial depression, climatic conditions, the incidence of sickness and many other matters, and in the end had to confess that all the voluminous statistics collected failed to reveal any explanation of Manchester's high drug cost. The failure to find a satisfactory explanation was only to be expected in view of the unsatisfactory one mentioned, which is referred to in an appendix to the report. The chief medical report that during a long period of prosperity in the cotton mills the household custom was established in Lancashire of having a standing account with a physician and a firm belief in the bottle of medicine. The subcommittee finally quotes a warning to physicians that they may be fined for overprescribing. —*J.A.M.A.,* May 11, 1935.

*Admission to Dental Practice:* Little has been heard of late about the question of extending the privileges and the medical activities of the nature cure doctors. If any progress in this direction has been made, it has not been announced. Doubtless the opposition has proved to be greater than was anticipated. On the other hand, an old demand of the dental technicians has been granted. In place of the term dental technician, which in German usage plainly designates the limited training of such persons in comparison with the academically trained dental physicians, the federal minister of labor has substituted the term "dentist." At the Berlin Lehrinstitut für Dentisten, persons without means are supplied with prostheses free of charge. April 1, there will be opened in Düsseldorf one of the seven dental schools to be created throughout the reich, and it promises to be the most modern school for dental technicians in Germany. The director will be a dental technician, or "dentist," and not a *zahnarzt,* or dental physician. Both dental physicians and dental technicians must be entered in a register before they are admitted to practice. According to a recent decree, an applicant will not be admitted unless he and his wife are of Aryan origin. The previous exception, according to which front line combatants, including the fathers and sons of persons who died in the World War, were admitted even though of non-Aryan origin, has been abolished. This makes the application of the regulations much more severe and works a hardship on the sons of men who died in the war, who, relying on the previous exceptional privilege, have already partially completed their courses in dentistry. Furthermore, a license to practice already granted will be withdrawn if an Aryan dental physician or "dentist" admitted to panel practice marries a woman of non-Aryan origin or has married such a woman since July 1, 1933. A system of relief, organized by the dental physicians and supported in part by the federal government, has been created in the sections of Röhn and Spessart, two high plateau regions of Germany that have suffered severely from the economic crisis. Four Berlin dental physicians with four woman assistants have treated, during the past few months, more than 1,500 children gratis in this area. It is planned to give dental aid to about 8,000 children.— *J.A.M.A.,* May 18, 1935.

## Deaths

*Arnold, Lucien L.,* Chicago, Ill.; Northwestern University Dental School, 1894; died May 4; aged 73.

*Buchner, Hewert O.,* Chicago, Ill.; Northwestern University Dental School, 1930; died May 7; aged 28.

*Cole, Walter Samuel,* Hanover, N. H.; Pennsylvania College of Dental Surgery, 1900; died February 20; aged 61.

*Shahan, Leslie E.,* Chicago, Ill.; State University of Iowa, College of Dentistry, 1911; died April 11; aged 49.

*Shupert, Harry Lewis,* Alpena, Mich.; Northwestern University Dental School, 1898; died March 29; aged 59.

*Smith, Otto B.,* Waukegan, Ill.; Northwestern University Dental School, 1900; died May 31; aged 57.

*Todd, William L.,* Linton, Ind.; Indiana University School of Dentistry, 1900; died March 26.

# MISCELLANY

## BOOK REVIEWS

*Common Sense in Dentistry (A National Necessity).* By Edward Samson, L.D.S., R.C.S., Eng., F.C.S., Honorary Dental Surgeon to the Royal Victoria and West Hants Hospital, Bournemouth. Borough Dentist to the Borough of Bournemouth. School Dentist to the Bournemouth Dental Clinic. With an introduction by Professor W. H. Gilmour, LL.D., M.D., L.D.S., Director of Dental Education at the University of Liverpool. 100 pages; price 7 shillings and 6 pence in Great Britain. Published by J. S. Cottrell & Co., 15-17 Charlotte St., London, England.

If the author of this book has ever written an uninteresting sentence, we have failed to see it. His various papers in our periodical literature have always been characterized by originality of ideas and a unique approach to the problem in hand. As Professor Gilmour intimates in his introduction to the book, the author employs "a novel but humorously provocative method." Naturally, the book deals with the two major affections that concern the dentist, caries and pyorrhea, and of the latter lesion, Professor Gilmour wisely says: "Yet whether the disease is of systemic or local origin, or both, so far the results of manipulative instrumentation far outweigh the other treatments advocated." The major part of Samson's book consists of a satirical review of most of the current theories of the day, and the author defends his manner of approach by saying: "There is no reason, however, to believe that I have not hit upon the truth because my touch was lighter." Among other theories that are more or less held up to ridicule, he mentions vitamins, and says: "It seemed almost inevitable—a kind of scientific kismet that caries and vitamins should meet." And also: "I dread to think of the causative factors of caries and pyorrhea when we have reached vitamin Z." At least the author compels the reader to think, and his great emphasis is on the apparent futility of our present methods of practice to cope with dental disease. And then he says naively: "The invention of dentures was the mother of the necessity to wear them. It is a thought worth contemplating that a five years' holiday from any form of denture construction might see many more octogenarians using their own teeth—I wonder!" So does the reviewer wonder. The undue exaltation of the virtues of artificial dentures in our literature may have something to answer for yet. The author pays his respects to the research worker in the following: "There is nothing a keen researcher cannot prove if he tries hard enough." All through the work, there are sallies of this sort, and the reader is kept constantly entertained. But the major and more serious plea is for an organized effort on the part of our profession, or more pointedly on the part of the government, to see that the cause of dental disease is run down and the condition prevented. Logically enough, mention is made of other scourges of mankind that almost threatened extermination till an organized effort was

put forth and the problem solved. Hydrophobia was mentioned in this connection, and many other species of plagues, with the inference that if these diseases can be prevented, there is no reason why dental disease cannot be brought under control. The work winds up with a most impassioned plea for a right-about-face in methods of approach in attacking the existent problems, and recommends a government inquiry into dental disease, with the proposal to establish a national laboratory of dental research. The book is not only enlightening, but entertaining as well.

***Applied Orthodontics: An Introductory Text for Students and Practitioners of Dentistry.*** By James David McCoy, M.S., D.D.S., F.A.C.D., Associate Clinical Professor of Surgery (Oral), School of Medicine, University of Southern California, Los Angeles, Calif.; formerly Professor of Orthodontics in the College of Dentistry, University of Southern California, Los Angeles, Calif. Fourth edition, thoroughly revised; published 1935. Octavo, 336 pages, illustrated with 220 engravings. Cloth, $4.50 net. Published by Lea and Febiger, Philadelphia.

The thing most manifest in Dr. McCoy's work is his evident willingness to scrap preconceived opinions, even his own, and revert to fundamental principles whenever occasion seems to demand it. The science of orthodontia, or orthodontics, as the modern version has it, is constantly undergoing evolution, and this is the warrant for the present volume. The third edition came out in 1931, and even in the brief period since that time, the author has found much that required revision. One of the most significant chapters in the present volume has to do with the subject of "tissue change incident to movement of teeth." In the early history of the orthodontic art, little consideration was given to this interesting study, but in the present volume it is treated in a most scientific manner. Some of the illustrative matter in this section is exceptionally good, and when we consider the fact that tissue change constitutes one of the most essential agencies of orthodontic practice, the detail with which this process is portrayed is assuredly warranted. The book is beautifully printed and the press work admirable, as would be expected from this responsible firm.

## ANNOUNCEMENTS*

### CALENDAR OF MEETINGS

American Dental Association, New Orleans, La., November 4-8.

American Academy of Periodontology, New Orleans, October 31-November 2.

American Academy of Restorative Dentistry, New Orleans, November 2-3.

American Congress of Physical Therapy, Kansas City, Mo., September 9-12.

American Society of Oral Surgeons and Exodontists, New Orleans, November 1-2.

American Dental Society of Europe, London, July 31-August 3.

Association of American Women Dentists, New Orleans, November 4.

Belgian National Dental Congress, Brussels, August 1-4.

Dental Alumni Association, American University of Beirut, Beirut, Lebanon, June.

Greater New York December Meeting, New York City, December 2-6.

International Dental Congress, Vienna, Aug. 2-9, 1936.

International Dental Federation, Brussels, Belgium, August 4-10.

Odontological Society of Western Pennsylvania, Pittsburgh, October 15-17.

Pacific Coast Dental Conference, Long Beach, Calif., July 8-12.

*Announcements must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

Montreal Dental Club Fall Clinic, October 17-19.

American Dental Assistants Association, New Orleans, November 4-8.

American Dental Hygienists' Association, New Orleans, November 4-8.

Society for the Advancement of General Anesthesia in Dentistry, New York City, third Monday in February, April, October and December.

District of Columbia at George Washington University, Washington, D. C., second and fourth Tuesdays in each month from October to June, inclusive.

### STATE SOCIETIES

July

Southern California, at Long Beach (8-12)

Virginia, at Hot Springs (1-3)

### STATE BOARDS OF DENTAL EXAMINERS

Arizona, at Flagstaff, July 1. R. A. McCall, 719 Professional Bldg., Phoenix, Secretary.

Montana, at Helena, July 8-11. Leonard A. Jenkin, 214 Medical Arts Bldg., Great Falls, Secretary.

South Dakota, at Sioux Falls, June 29-July 3. H. C. Whitney, Secretary, Wessington Springs.

Utah, at Salt Lake City, July 17-20. J. H. Davis, First National Bank, Salt Lake City, Secretary.

### CORRECTION

### MONTANA STATE BOARD OF DENTAL EXAMINERS

Examinations for license to practice dentistry or dental hygiene in Montana will be held at Helena, July 8-11. For further information and application blanks, address

LEONARD A. JENKIN, *Secretary,*
214 Medical Arts Bldg.,
Great Falls.

### SOUTH DAKOTA STATE BOARD OF DENTAL EXAMINERS

The next meeting of the South Dakota State Board of Dental Examiners will be held at the Carpenter Hotel, Sioux Falls, June 29-July 3. Address all correspondence to

H. C. WHITNEY, *Secretary,*
Wessington Springs.

### ASSOCIATION OF AMERICAN WOMEN DENTISTS

The fourteenth annual meeting of the Association of American Women Dentists will be held at the Roosevelt Hotel, New Orleans, November 4.

ELSIE GERLACH, *Chairman,*
Publicity Committee,
1838 W. Harrison St.,
Chicago, Ill.

### AMERICAN ACADEMY OF RESTORATIVE DENTISTRY

The American Academy of Restorative Dentistry will meet in New Orleans, at the St. Charles Hotel, November 2-3.

A. F. SCHOPPER, *Secretary,*
Professional Bldg.,
Kansas City, Mo.

### GREATER NEW YORK DECEMBER MEETING

The eleventh Greater New York December Meeting will be held at the Hotel Pennsylvania, New York City, December 2-6.

GEORGE C. DOUGLASS, *Chairman,*
Press and Publication Committee.

### ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA

The fifty-fourth annual meeting of the Odontological Society of Western Pennsylvania will be held October 15-17 at the William Penn Hotel, Pittsburgh.

A. G. WICKS, *Secretary,*
Jenkins Bldg.,
Pittsburgh.

### AMERICAN SOCIETY FOR THE ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY

The next regular meeting of the American Society for the Advancement of General Anesthesia in Dentistry will be held in the Tower Room of the Hotel Montclair, New York City, October 28, with

dinner at 7 p. m. and the scientific session at 8:30.

HARRY J. FIELD, *Secretary,*
130 Market St.,
Newark, N. J.

### AMERICAN CONGRESS OF PHYSICAL THERAPY

The American Congress of Physical Therapy announces two events: 1. An instruction class covering the field of physical therapy for September 5-7. 2. The fourteenth annual scientific and clinical session for September 9-12. Both will be held at the Hotel Kansas Citian, Kansas City, Mo. A joint meeting with the Jackson County Medical Society will be held September 10. Preliminary program and circular of information may be secured by addressing the American Congress of Physical Therapy, 30 N. Michigan Ave., Chicago, Ill.

### MONTREAL DENTAL CLUB FALL CLINIC

The eleventh annual Fall Clinic of the Montreal Dental Club will be held at the Mount Royal Hotel, October 17-19. C. W. Bierman, Minneapolis, will speak on children's dentistry; U. G. Rickert, Ann Arbor, Mich., on materia medica and therapeutics; Victor H. Sears, New York City, on full denture construction, and H. W. MacMillan, Cincinnati, on oral surgery. The Mount Royal Hotel offers special rates to visiting dentists. Membership fee, nonresident, $5; resident, $10, including complimentary luncheons.

F. W. SAUNDERS, *Chairman,*
Publicity Committee,
1414 Drummond St.,
Montreal.

### DENTAL HYGIENISTS OF CALIFORNIA

The fifteenth annual meeting of the California Dental Hygienists' Association will be held in conjunction with the Pacific Coast Dental Conference at Long Beach, July 8-13.

BERNICE E. HOKE, *President,*
808 W. P. Story Bldg.,
Los Angeles.

### F. D. I.

The Ninth International Dental Congress of the Fédération Dentaire International will be held in Vienna the first week in August, 1936. The purpose of the Congress is to further the progress of dental art and the international relations of the dental profession. The Congress is organized under the control of the F.D.I., by an organization committee constituted in accordance with Article 16 of the F.D.I. Statutes, as follows: One-third of its membership shall be appointed by the Executive Council of the F.D.I.; the remaining two-thirds shall be appointed by the Austrian dental bodies affiliated with the F.D.I. The application for participation in the Congress is passed on by the competent National Committee to the Committee of Organization (Vienna IX, Währingerstrasse, 25 a), which approves the application. Each National Committee is responsible for authorizing the participation of the members whose names it has sent in. Persons living in countries where no National Committee was constituted must apply directly to the Committee of Organization. Members may be: (a) active; (b) honorary, or (c) associate. Every practicing dentist possessing the legal qualification to practice dentistry in the country in which he received his professional instruction, or in the country in which he practices, may be an active member of the Congress. Physicians and those who have some other scientific profession may also be admitted as active members. Candidates for admission to the Congress as active members must forward an application stating: 1. Address in full. 2. Professional and scientific qualifications and titles. 3. Names of professional societies to which they belong. The application must be accompanied by a visiting card and the subscription. The subscription is 70 schillings austrian, or 60 schillings if paid before Jan. 31, 1936. Members of the F.D.I. of not less than three years' standing, and whose subscriptions are not in arrears shall be admitted to full active membership in the Congress without fur-

ther payment except that the treasury of the F.D.I. shall pay a sum equal to half the Congress subscription for each member. Qualifications for Honorary membership and associate membership will be published later.

### CAN YOU AID THE POLICE OF THE STATE OF VERMONT IN THE MIDDLEBURY TRAGEDY?

You have probably read of the finding of three skeletons near Middlebury, Vt. One, of an adult, assumed to be the mother and two children, probably girls. The death may have occurred two years ago or less. All victims bore bullet holes in their skulls. The only clue to identification at present is the orthodontic work in the mouth of the elder child. This is minutely described by Alfred P. Rogers, of Boston, in the May 21 issue of the *Boston Globe*. Further description of the orthodontic appliances follows: Upper: L Angles' large ribbon arch No. g-400-YA. 6 Angles' bands anterior No. G-430-XA. 2 Made up molar bands with 2 Angles' gold Tubes No. G-460 soldered on. 2 Intermaxillary anchorage hooks placed opposite the mesial third of the cuspids have balled ends. Angles' lock pins No. G-453-A are used on the anterior bands. Lower: Lingual arch made of round 19-gage platinum wire, not Angles'. 2 Made up molar bands with soldered on half round tubes. Spring locks made of 0.028 wire. Dental work in the mouth of the supposed mother, while not significant for purposes of identification at long range, exhibited the high character of the child's orthodontic work. In cooperation with the police we are passing this information to orthodontists with the hope that some one may recognize his work from the description and establish identification. You are requested to communicate with Mr. John P. Conley, Attorney for the State of Vermont.

The S. S. White Dental Mfg. Co.
May 28, 1935.

### MURDERER SOUGHT

The Federal Bureau of Investigation, U. S. Dept. of Justice, requests the cooperation of the dental profession in apprehending one Merton Ward Goodrich. Description: age, 25 years (born May 7 or 8, 1909 at Oan, W. Va.); height, 5 feet

10½ inches; weight, 120 pounds; build, slender; hair, thin, light brown, slightly bald, front; eyes, dark hazel, protruding, dark circles beneath; complexion, sallow; ears, prominent and protruding; teeth, lower teeth dirty, four teeth in front of large discolored tooth in upper left jaw missing, black stubs in upper right jaw; scars, slight scar on right cheek; occupation, piano player and trap drummer, magazine salesman, radiotrician; peculiarities, shuffling walk with head down, apparently consumptive, heavy drinker. Notify nearest office of Federal Bureau of Investigation by phone or telegraph collect.

JOHN EDGAR HOOVER, *Director*,
Federal Bureau of Investigation,
U. S. Department of Justice.

## AMERICAN DENTAL ASSOCIATION

New Orleans, La. November 4-8, 1935.

### HOTEL RESERVATION

In securing hotel reservations for the 1935 Session, consult the hotel rate-sheet and fill out the blank application below. Mail immediately to the hotel you wish to patronize. The hotel will then advise you of the reservation which has been made for you.

In case your first choice cannot be made, kindly indicate second and third choices. If none of your choices are available, the hotel manager will mail your application to the Chairman of Halls & Hotels Committee, who will make as favorable reservation for you as possible.

Please remember that a reservation constitutes a contract with the hotel to provide you with the accommodations you desire. If you find it impossible to carry out your part of the contract, namely, to occupy the room at the time agreed on, please write or wire the hotel, releasing the room reserved for you in order that it may be available to others attending the meeting.

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## MAIL THIS APPLICATION DIRECT TO THE HOTEL

### HOTEL RESERVATION

AMERICAN DENTAL ASSOCIATION, NEW ORLEANS, LA., NOVEMBER 4-8, 1935.

.....Hotel.
New Orleans, La.
Please reserve sleeping accommodations as noted below:

.....Room (s) With bath for.....people. Rate desired per day $.....

.....Room (s) Without bath for.....people. Rate desired per day $.....

Second choice hotel..... Third choice hotel.....

| ROOMS TO BE OCCUPIED BY: | ADDRESS IN FULL |
|---|---|
| Applicant..... | ..... |
| ..... | ..... |
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Please confirm this reservation to applicant. I further agree to notify the hotel at once in the event I am unable to use this reservation.

IMPORTANT TO HOTEL MANAGER: In the event you cannot accept this reservation, please forward this application at once to Dr. G. O. Rosado, Chairman Halls & Hotels Committee, 827 Maison Blanche, New Orleans, La., who will attend to the assignment of this reservation.

| HOTEL | WITH BATH | | |
|---|---|---|---|
| | One Person | Two Persons | Twin Beds |
| BIENVILLE HOTEL<br>Lee Circle | $2.00–2.50<br>3.00–3.50 | $3.50–4.00<br>5.00 | $5.00–6.00<br>7.00 |
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| LA SALLE HOTEL<br>1113 Canal Street | 2.00–2.50<br>3.00 | 3.50–4.00<br>5.00 | 5.00–6.00 |
| HOTEL MONTELEONE<br>214 Royal Street | 2.50–3.00<br>3.50–4.00 | 5.00–6.00 | 6.00–7.00<br>8.00 |
| HOTEL NEW ORLEANS<br>1300 Canal Street | 2.00–2.50<br>3.00–3.50 | 3.50–4.00<br>5.00 | 5.00–6.00 |
| PONTCHARTRAIN APT. HOTEL<br>2031 St. Charles Avenue | | 5.00–6.00 | |
| ROOSEVELT HOTEL<br>123 Baronne Street | 3.00–3.50<br>4.00–4.50<br>5.00–6.00 | 5.00–6.00<br>7.00 | 7.00–8.00<br>9.00 |
| ST. CHARLES HOTEL<br>211 St. Charles Street | 2.50–3.00<br>3.50–4.00<br>4.50–5.00 | 4.50–5.00<br>6.00–6.50 | 6.00–7.00<br>8.00 |

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**November 4 to 8, 1935**

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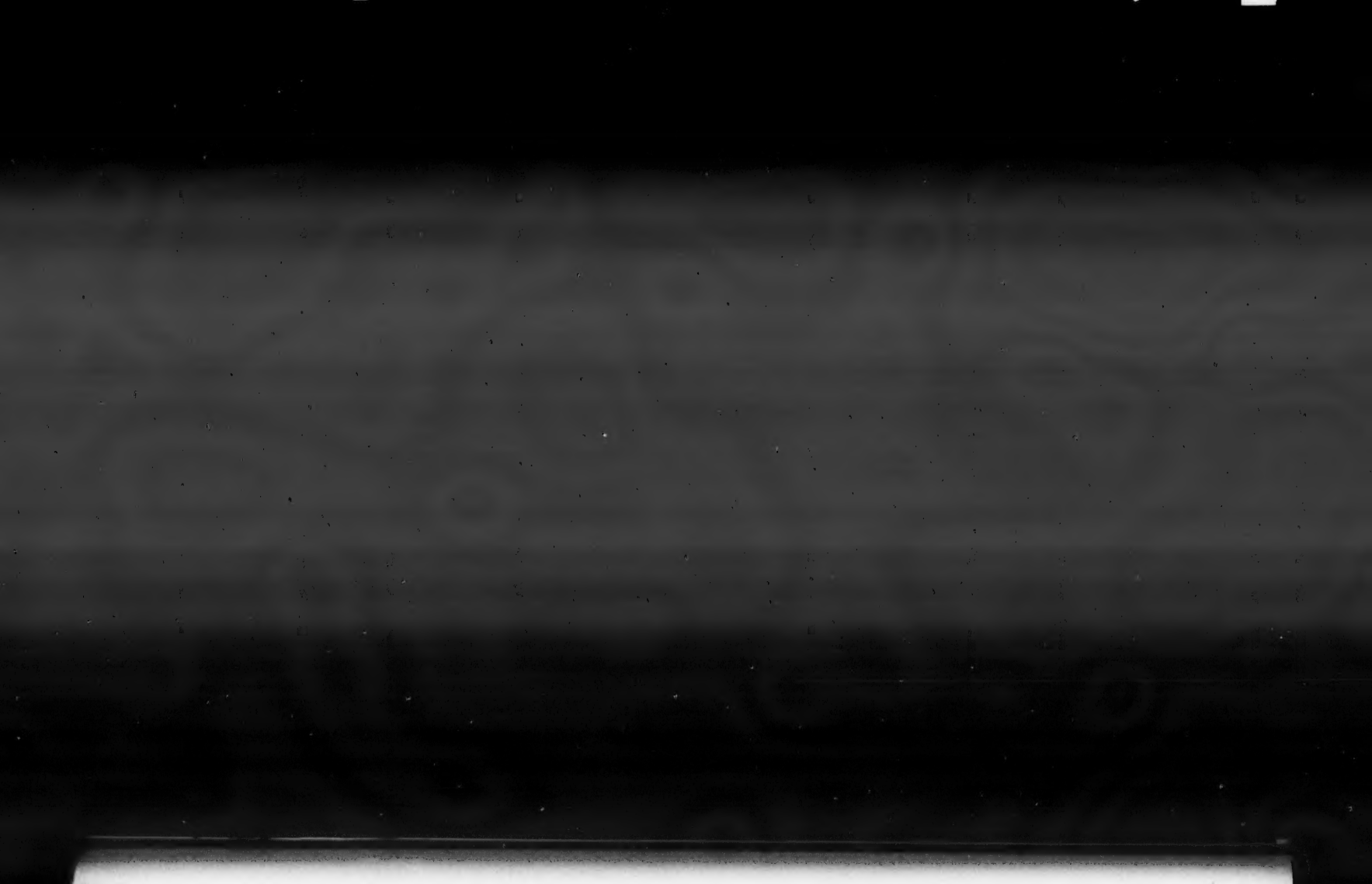
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